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ESSENTIALS OF
MATERIA MEDICA AND THERAPEUTICS

HENRY MORRIS M.D.

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THE
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A MONTHLY JOURNAL OF MEDICINE

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ESSENTIALS OF MATERIA MEDICA, THERAPEUTICS, AND PRESCRIPTION WRITING

ARRANGED IN THE FORM OF

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PREPARED ESPECIALLY FOR

STUDENTS OF MEDICINE.

BY

HENRY MORRIS, M.D.,
LATE DEMONSTRATOR, JEFFERSON MEDICAL COLLEGE, PHILADELPHIA; CO-EDITOR BIDDLE'S
MATERIA MEDICA; VISITING PHYSICIAN TO ST. JOSEPH'S HOSPITAL; FELLOW
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SECOND EDITION.

PHILADELPHIA.
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DEPRIVED THE MEDICAL PROFESSION OF AN EARNEST

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PREFACE.

The object of this little book is, not to replace or attempt to replace with the student the larger text-books on Materia Medica, but simply to give him, in condensed form, the principles of this branch of medicine, without a knowledge of which he can neither pass his final examinations, nor practice his profession intelligently.

The author hopes that, if properly used, this book will be of service to the student and young practitioner, but he is sure, from his experience as a teacher, that neither this nor any other "compend" will suffice to form the groundwork of what is really the study of a lifetime—the Science of Medicine.

In regard to the classification of drugs, he would say that this work was commenced before the excellent arrangement contained in the last edition of Prof. Wood's Therapeutics was published, and not being satisfied with any of the groupings which he had seen, he was induced to adopt a classification based on therapeutic rather than physiological grounds, which, however, he is pleased to think agrees very nearly with that of the latest edition of Wood. In conclusion he must acknowledge his indebtedness not only to the standard text-books, such as the admirable works of Wood, Bartholow, Ringer, Lauder Brunton and many others, but also to many writers in the medical journals, both of this and other countries, to whom want

70521

of space has prevented him from giving due credit in the appropriate place. He must also acknowledge the kindness of his friend, Dr. Henry D. Moore, to whom he is indebted for the preparation of the index.

Believing that the critic is the best friend of the medical author, he will thankfully receive any criticisms or hints from either public or private sources.

HENRY MORRIS.

313 South 16th St., Philadelphia.
August, 1889.

TABLE OF CONTENTS.

PAGES

DEFINITIONS.—(Materia Medica, Pharmacy, Pharmacology, Therapeutics, Remedies, Pharmacopœia, Dispensatory, Officinal preparations), ... 17–23

WEIGHTS AND MEASURES.—(Troy or Apothecaries' weights, Wine or Apothecaries' measure, Metrical or decimal system of weights, Approximate measures), ... 23–25

PRESCRIPTION WRITING.—(Purposes for which medicines are combined, Precautions to be observed in prescription writing, Component parts of a prescription, Method of writing a prescription, Calculation of dose, General rules for dosage), ... 25–30

CIRCUMSTANCES MODIFYING THE EFFECTS OF MEDICINE.—(Age, Sex, Idiosyncrasy, Constitution, Habitual use, Condition of the digestive and absorbent systems, Diseases, Mode of administration), ... 30–31

ADMINISTRATION OF MEDICINES.—(Enepidermic, Epidermic, Endermic, and Hypodermic methods, By the mucous membranes, By intravenous injection), ... 31–32

CLASSIFICATION OF MEDICINES, ... 32–33

GROUP I.—SYSTEMIC MEDICINES, ... 34–218

CLASS I.—MEDICINES ACTING ON THE BODY AT LARGE, BY THEIR INFLUENCE ON DIGESTION, NUTRITION (tissue waste and repair), AND CALORIFICATION, ... 34–84

ORDER 1.—*Digestants*—(Pepsin, Ingluvin, Pancreatin, Papain, Extract of Malt), ... 34–36

ORDER 2.—*Tonics*—(Quassia, Gentian, Calumba, Chirata, Serpentaria, Eucalyptus, Prunus Virginiana,

PAGES

Anthemis, Matricaria, Eupatorium, Magnolia, Cascarilla, Absinthium, Cinchona, and its alkaloids, Cornus, Salix, Hydrastis, Preparations of Iron and of Manganese, Phosphorus, Mineral acids, Lactic acid), 36–59

ORDER 3.—*Alteratives*—(Preparations of Mercury and of Gold, Iodine, the Iodides, Arsenical preparations, Cod-liver oil, the Phospates and Hypophosphites, Ammonium chloride, Calcium chloride, Colchicum, Sarsaparilla, Guaiac, Mezereum, Menispermum, Calendula, Sassafras, Stillingia, Dulcamara), . 59–76

ORDER 4.—*Antipyretics*—(Antipyrine, Acetanilid, Quinine, Salicin, Salicylic acid, the Salicylates, Salol, Acetphenetidin, Resorcin, Hydroquinone, Pyrocatechin, Chinoline, Thalline, Kairine), ... 76–83

CLASS II.—MEDICINES ACTING ON THE BODY, BY THEIR EFFECTS ON THE VARIOUS ORGANS, . 84–181

(*a*) ON THE NERVOUS SYSTEM, ... 84–128

ORDER 1.—*Hypnotics*—(Opium and its alkaloids, Chloral, the Bromides, Hyoscine, Paraldehyd, Hypnone, Urethan, Cannabis Indica and Americana, Humulus, Lactucarium), ... 84–95

ORDER 2.—*Mydriatic Anodynes*—(Belladonna, Stramonium, Hyoscyamus, Duboisia, Erythroxylon and their alkaloids, Antipyrine), ... 95–103

ORDER 3.—*Anæsthetics*—(Ether, Chloroform, Nitrous oxide, Methylene bichloride, Ethyl bromide, Bromoform), ... 103–109

ORDER 4.—*Antispasmodics*—(Musk, Valerian, the Valerianates, Asafetida, Camphor, Monobromated camphor, Oil of amber, Ethereal oil, Hoffman's anodyne, Cypripedium, Scutellaria). 109–114

ORDER 5.—*Excito-motors*—(Nux vomica and its alkaloids, Ignatia, Rhus toxicodendron, Picrotoxin), 114–118

ORDER 6.—*Depresso-motors*—(Physostigma, Chloral, the Bromides, the Nitrites, Gelsemium, Prussic acid, the Cyanides, Oil of Bitter Almonds, Lobelia, Conium, Woorara, Tobacco), ... 118–128

(*b*) ON THE ORGANS OF CIRCULATION, ... 129–150

PAGES

ORDER 1.—*Stimulants*—(Alcohol, Ether, Ammonium, Atropine, Digitalis, Caffeine, Adonidine, Strophantus, Sparteine, Strychnine, Cimicifuga), ... 129–141

ORDER 2.—*Sedatives*—(Antimonial preparations, Aconite and its alkaloids, Veratrum Viride, Veratrine, Gelsemium, Pulsatilla, Arnica, the Vegetable acids), 141–150

(*c*) ON THE SEXUAL ORGANS, ... 150–158

ORDER 1.—*Aphrodisiacs*—(The Tonics generally, especially Phosphorus, Zinc phosphide and Iron. The Phosphates and Hypophosphites, Gold, Arsenic, Cod-liver oil, Opium, Alcohol, Cannabis Indica, Musk, Camphor, Nux vomica, Stimulants, Hamamelis, Ergot, Cantharides, Myrrh), ... 150–151

ORDER 2.—*Anaphrodisiacs*—(Nauseants, Purgatives, Opium, (full doses), the Bromides, Monobromated Camphor, Iodine and the Iodines, Potassium nitrate, Ammonium chloride, Belladonna, Tobacco, Conium, Cardiac sedatives, Digitalis, Cocaine), . . . 151

ORDER 3.—*Oxytocics*—(Ergot, Ustilago, Cotton-root bark, Quinine), ... 151–155

ORDER 4.—*Uterine Sedatives*—(Opium, Cannabis Indica, the Bromides, Chloral, Tartar emetic, Ether, Viburnum), ... 155

ORDER 5.—*Emmenagogues*—(Preparations of Iron, of Arsenic, and of Manganese, Myrrh, Aloes, the salines, Potassium permanganate, Savine, Oil of Rue, Tansy, Apiol, Cantharides, Guaiac), ... 156–158

(*d*) ON THE ALIMENTARY CANAL, ... 158–181

ORDER 1.—*Emetics*—(Ipecac, Apomorphine, Mustard, Zinc sulphate, Copper sulphate, Alum, Turpeth mineral, Tartar emetic), ... 158–162

ORDER 2.—*Gastric Sedatives*—(Calomel, Ice, Lime-water, Brandy, Morphine, Diluted hydrocyanic acid, Creasote, Bismuth, Carbolic acid, Thymol, Sulphurous acid, the Sulphites, Charcoal, the Bromides, Nux vomica, Cereum oxalate, Ipecac (minute doses), Fowler's solution, Counter-irritation), ... 162–163

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PAGES

ORDER 2.—*Vesicants*—(Cantharides, Potato-bug, Ammonia), ... 231-233

ORDER 3.—*Pustulants*—(Croton oil, Antimonial ointment), ... 233

ORDER 4.—*Escharotics*—(Caustic potash, Caustic soda, Arsenious acid, Bromine, Zinc chloride, Acid nitrate of mercury, Corrosive sublimate, Potassium bichromate, the Mineral acids, Silver nitrates, Copper sulphate, Alum), ... 233-235

CLASS III.—DEMULCENTS—(Water, Acacia, Tragacanth, Slippery-elm bark, Marshmallow, Flaxseed, Sassafras pith, Quince-seed, Liquorice-root, Iceland moss, Irish moss, Starch, Isinglass), . . . 236-238

CLASS IV.—EMOLLIENTS—(Lard, Suet, Lanolin, Spermaceti, Wax, Oleic acid, Glycerine, Cacao-butter, Cotton-seed oil, Oil of benne, Petrolatum, the Demulcents), ... 239-240

CLASS V.—PROTECTIVES—(Plasters, Ointments, Collodion, Solution of gutta-percha, Solution of sodium silicate), ... 241

CLASS VI.—COLORING AGENTS—(Cochineal, Saffron, Red saunders), ... 242

INDEX, ... 243

QUESTIONS AND ANSWERS

ON THE

ESSENTIALS OF MATERIA MEDICA AND THERAPEUTICS.

What is meant by the term "materia medica"?

Materia medica is that division of medical science which treats of all that relates to the medicines employed in the treatment of disease. It embraces the study of the source of remedies, their physical and chemical properties, their action in medicinal doses on the human body both in health and disease, their poisonous effects and the means by which they may be antagonized, and the methods of preparing and administering them; and is closely allied to botany, mineralogy, zoölogy, chemistry, physiology and pathology.

How may this knowledge be subdivided?

Into *Materia Medica Proper*, *Pharmacy*, *Pharmacology* including *Toxicology*, and *Therapeutics.*

What is materia medica proper?

By materia medica proper is understood a description of the source, and the physical and chemical characteristics of remedies.

What is pharmacy?

Pharmacy (*φάρμακον*, a medicine) relates to the preparation and combination of remedies.

What is pharmacology?

Pharmacology (*φάρμακον*, a medicine, and *λόγος*, a discourse), though originally meaning a "treatise on drugs" or "on pharmacy," is now usually applied only to the study of the action of drugs on the body, and embraces toxicology (*τοξικόν*, poison with which arrows are smeared, and λόγος, a discourse), which deals with poisons and their antidotes.

What are therapeutics?

Therapeutics (θεράπευω, I take care of, or, cure) deals with the application of remedies to disease, and may be either *empirical* or *rational.*

How does empirical differ from rational therapeutics?

When a remedy is given in any disease because it has succeeded in similar cases before, although the manner in which it acts is often not understood, it is given empirically. When a remedy is prescribed because, from a knowledge of its action on the body, it is likely that it will antagonize or overcome a particular pathological condition, it is administered on the rational plan. Rational therapeutics is the more scientific, and is the outgrowth of pharmacology.

What are remedies?

Remedies are the agents employed in the treatment of disease.

How may remedies be classified?

Remedies are subdivided into *mechanical*, *physical*, *dietetic*, *hygienic* and *pharmaceutical* agents. The first four classes are usually treated of in works especially devoted to such subjects.

What are mechanical remedies?

Venesection; local bloodletting by means of leeches, cups, scarifications, incisions or punctures; bandages; splints; sutures; ligatures; acupressure needle and forceps; acupuncture; aspiration; frictions; massage, etc., are mechanical remedies and are described in works on surgery.

What are physical remedies?

When light, heat or cold, electricity, galvanism or other of the physical forces are used in the treatment of disease, they are spoken of as *physical remedies.* They are treated of at length in works on physics and in books devoted to them exclusively.

What is meant by dietetic remedies?

All relating to the food of the sick* or to special plans of diet, are included under this head.

---

* In some diseases the diet is equally or more important than medication, *e.g.*, in diabetes mellitus, or in various forms of dyspepsia.

What are hygienic remedies?

The clothing, bathing and cleanliness of the sick, the ventilation of the sick room, etc., belong to this subdivision, and will be found in works on practice of medicine, but more particularly in those relating to hygiene.

What are pharmaceutical remedies?

Pharmaceutical remedies or "medicines, are substances not essentially alimentary, which, when applied to the body, so alter or modify its vital functions as to be rendered applicable to the treatment of diseases." * It is preëminently with this subdivision that materia medica deals.

What is meant by "officinal" or "official" preparations?

These terms are generally applied synonymously to such remedies as are authorized (*officialis*) by the Pharmacopœia, and directed by it to be kept in the shops (*officina*).

How does a pharmacopœia differ from a dispensatory?

A *pharmacopœia* (*φάρμακον*, a medicine, and *ποίεω*, to make) is a book containing directions for the preparation of medicines with the object of uniformity of nomenclature, preparation and strength. The U. S. Pharmacopœia has been decennially revised since 1820, when it was first authorized by a representative convention of druggists and physicians, held at Washington. It is an authoritative list of remedies, with formulæ for such preparations as may be in general use. "A *dispensatory* differs from a pharmacopœia in containing the physical and medical history of the various substances." It "contains the whole of the pharmacopœia" "with additions by the author, under whose authority alone it usually appears" (Dunglison). It treats, also, of the therapeutics, modes of administration and doses of the various drugs, "while the pharmacopœia is restricted to the mode of preparing them."

How may the officinal preparations be classified?

They may be classified according to their physical state, into *solids*, *semi-solids* and *liquids*.

Name the officinal solid preparations.

Abstracts, lozenges, papers, pills, powders, and triturations.

---

* Biddle's Materia Medica, 11th Ed., 1889, p. 46.

What are the officinal semi-solid preparations?

Confections, extracts, cerates, liniments, oleates, ointments, plasters and suppositories.

Mention the officinal liquid preparations.

Solutions, mixtures, waters, infusions, decoctions, tinctures, spirits, wines, glycerites, fluid extracts, honeys, syrups, vinegars and oleoresins.

What are abstracts?

Abstracts (*abstracta*) are alcoholic extracts in the form of powders diluted with sugar of milk, and are double the strength of the drugs from which they are made.

What are lozenges?

Lozenges or troches (*trochisci*) are dry, solid medicines made of powders incorporated usually by means of mucilage and sugar, intended to be slowly dissolved in the mouth.

What are papers?

Papers (*chartæ*) are made by soaking bibulous paper in medicinal solutions (*e.g.*, charta potassii nitratis), or by spreading medicinal mixtures on paper (*e.g.*, charta cantharides).

What are pills?

Pills (*pilulæ*) are preparations of such size that they can be conveniently swallowed whole. They usually contain some excipient to give the proper degree of tenacity to their particles, and are rolled into a spherical form.

What are powders?

Powders (*pulveres*) are dry solid medicines in a minute state of subdivision.

What are triturations?

Triturations (*triturationes*) consist of 1 part of a medicinal substance and 9 parts of sugar of milk thoroughly mingled and reduced to a fine powder in a mortar.

What is a confection?

Confections or conserves (*confectiones*) are remedies made into a soft mass with sugar, honey, etc., which render them more pleasant to the taste.

What are extracts?

Extracts (*extracta*) are made by evaporating solutions of vegetable substances (or in some cases the juices expressed from plants) to a pilular consistence. They are called aqueous or watery, alcoholic and acetous extracts, according to the menstruum used as a solvent.

What are cerates?

Cerates (*cerata*) are unctuous preparations, intended for external application, mixed with wax, spermaceti or resin, which gives them a firm consistence, and prevents them from melting at the temperature of the body.

What are liniments?

Liniments (*linimenta*) are oleaginous preparations, intended for external application with friction.

What are oleates?

Oleates (*oleata*) are solutions in oleic acid of metallic salts or alkaloids, and are applied externally.

What are ointments?

Ointments or unguents (*unguenta*) are medicaments incorporated with some fatty substance, and intended for external use. They are of the consistence of lard.

What are plasters?

Plasters (*emplastra*) are preparations spread on linen, muslin, silk or sheepskin, and are intended to adhere closely to the surface to which they are applied.

What are suppositories?

Suppositories (*suppositoria*) are made by incorporating medicinal substances with oil of theobroma, and are intended for introduction into the rectum or vagina. They are of conical form, to facilitate their insertion.

What are solutions?

Solutions (*liquores*) are preparations in which a non-volatile substance is entirely dissolved in the menstruum (usually water).

What are mixtures?

Mixtures (*misturæ*) are preparations in which, by means of some viscid substance, an insoluble medicine is suspended in water.

What are waters?

Waters (*aquæ*) are aqueous solutions of gaseous or volatile substances.

What are infusions?

Infusions (*infusa*) are aqueous preparations obtained by *pouring* hot or cold water on vegetable substances and allowing it to remain sufficiently long to extract the virtues of the drug.

What are decoctions?

Decoctions (*decocta*) are aqueous preparations obtained by *boiling* vegetable substances in water for a few minutes and allowing them to cool in closely-covered vessels.

What are tinctures?

Tinctures (*tinctura*) are alcoholic solutions, usually of non-volatile substances. Alcohol or diluted alcohol is generally used as a solvent, but occasionally the aromatic spirits of ammonia is employed, the product being called an *ammoniated tincture.*

What are spirits?

Spirits (*spiritus*) are alcoholic solutions of gaseous or volatile substances.

What are wines?

Wines (*vina*) are tinctures made with stronger white wine instead of alcohol.

What are glycerites?

Glycerites (*glycerita*) are medicinal substances mixed with glycerin.

What are fluid extracts?

Fluid extracts (*extracta fluida*) are liquid preparations of uniform strength, 1 c.c. of which represent 1 Gm. (about 1 minim to the grain) of the crude drug, prepared chiefly with alcohol and glycerin.

What are honeys?

Honeys (*mellita*) are medicines dissolved in honey.

What are syrups?

Syrups (*syrupi*) are composed of *medicinal* substances, or of *flavoring* ingredients in sugar and water. *Simple syrup* is a concentrated solution of sugar in water.

What are vinegars?

Vinegars (*aceta*) are medicinal solutions in diluted acetic acid.

What are oleoresins?

Oleoresins (*oleoresinæ*) are concentrated extracts consisting chiefly of the resin dissolved in the oil of the drug from which they are obtained.

May medicines be prescribed in other forms than those referred to above?

Medicines are often administered in *capsules* (small, elongated gelatine boxes with rounded ends, which dissolve readily in the stomach), *granules* or *parvules* (very minute pills), *emulsions* (oils or resins suspended in a mixture by means of some viscid material), *enemata* (liquids injected into the rectum for their local or systemic effect), or *injections* (liquids forced by a syringe into the mucous passages or cavities, under the skin or into a blood vessel). *Inhalations* of vapors may be employed for their local effect on the bronchopulmonary tract or for their influence on the system at large, and *gargles* may be used as sedative, astringent or disinfecting and deodorizing applications to the buccal and pharyngeal mucous membranes. Externally, *poultices* (simple or medicated), *lotions* (washes), and *fomentations* (hot lotions applied on flannel or cloth and allowed to remain in contact with the surface), are also often used.

What weights and measures are used in prescribing and dispensing medicines?

Troy or apothecaries' weight is used in dispensing solids, while *wine or apothecaries' measure* is employed for liquids; occasionally the *metrical system* is used in prescribing.

What is apothecaries' weight?

In apothecaries' weight the pound is divided into ounces, drachms, scruples and grains, as follows:—

20 grains (gr.) = 1 scruple (℈).
60 grains or 3 scruples = 1 drachm (ʒ).
480 grains or 24 scruples or 8 drachms = 1 ounce (℥).
5760 grains or 288 scruples or 96 drachms or 12 ounces = 1 pound (℔).

The grain (gr.), drachm (ʒ) and ounce (℥) should alone be used in prescription writing.

What is wine measure?

In wine measure the gallon is divided into pints, flui-ounces, flui-drachms and minims, thus:—

60 minims (♏) = 1 flui-drachm (fʒ).
480 minims or 8 flui-drachms = 1 flui-ounce (f℥).
7680 minims or 128 flui-drachms or 16 flui-ounces = 1 pint (O).
61440 minims or 1024 flui-drachms or 128 flui-ounces or 8 pints = 1 gallon (C).

The minim (♏), flui-drachm (fʒ), flui-ounce (f℥) and, very seldom, the pint (O) are used in prescriptions.

Describe the metrical system of weights.

In the *metrical or decimal system* the gramme is multiplied or divided by ten, Greek prefixes denoting the multiplication, and Latin the subdivisions of the unit; thus:—

10 milligrammes = 1 centigramme.
100 milligrammes, or 10 centigrammes = 1 decigramme.
1000 milligrammes, or 100 centigrammes, or 10 decigrammes = 1 gramme.
10,000 milligrammes, or 1000 centigrammes, or 100 decigrammes, or 10 grammes = 1 decagramme.
100,000 milligrammes, or 10,000 centigrammes, or 1000 decigrammes, or 100 grammes, or 10 decagrammes = 1 hectogramme.
1,000,000 milligrammes, or 100,000 centigrammes, or 10,000 decigrammes, or 1000 grammes, or 100 decagrammes, or 10 hectogrammes = 1 kilogramme.

In writing prescriptions in the metrical system, the gramme (Gm.) alone is used for both solids and fluids, the abbreviation being *preceded* by *Arabic figures* or decimals denoting the amount of the drug (*e. g.*, 10.0 Gm.–0.02 Gm., etc.).

What is a gramme?

The gramme is the weight of a cubic centimeter (c. c.) of distilled water at 4° C. (39.5° F.).

What is a centimeter?

A centimeter ($\frac{4}{10}$ of an inch) is the $\frac{1}{100}$ of a metre (39.37 inches), which is the ten-millionth part of a quarter of a meridian of the earth (or of the distance from the pole to the equator).

What relation does the metrical system of weights bear to apothecaries' weight and measure?

1 gramme = 15.5 grains; 1 decigramme (0.1 Gm.) = 1.5 grains; 1 centigramme (0.01 Gm.) = .15 (or $\frac{1}{6}$) grain; 1 milligramme (0.001 Gm.) = .015 (or $\frac{1}{64}$) grain; 1 grain (gr.j) = .06 gramme; 1 drachm (ʒj) = 4.0 grammes (approximately); 1 ounce (℥j) = 32.0 grammes (approximately).

As the weight of a c. c. of fluid depends upon its density, 1.0 Gm. of a light liquid (*e. g.*, alcohol) will measure more than the same weight of a heavy liquid (*e. g.*, glycerin). Approximately, however, ♏j = .06 Gm.; fʒj = 4.0 Gm. (a little less), and f℥j = 32.0 Gm. (a little less).

What approximate measurements are used in medicine?

Medicines are sometimes ordered in *drops* instead of minims. As the size of the drop depends on a variety of circumstances, this is a bad practice. A *teaspoonful* is often used for fʒj, or 5.0 Gm.; a *tablespoonful* for f℥ss, or 20.0 Gm.; a *wineglassful* for f℥ij; but these are uncertain measures, and should only be employed when an excess of the quantity intended would be harmless. Graduated medicine glasses are easily obtained, and are much more reliable.

May a physician prescribe other formulæ than those contained in the Pharmacopœia?

The physician often extemporizes formulæ to meet the requirements of the individual case.

For what purposes are different remedies often combined in a single prescription?

Remedies are combined to increase or to moderate the effects of some single medicine, or to overcome some action which it is undesirable to produce; to procure the simultaneous action of drugs having different effects upon the body, or to form a new chemical compound, often differing in its action from those of the substances forming it; for convenience in administering, or for rendering nauseous drugs more palatable.

What precautions should be used in prescription writing?

The physician should be careful, while writing the prescription,—

1. To bear constantly in mind the object for which the medicine

is wanted, in order that he may better combine his remedies to accomplish his purpose.

2. The writing should be clear and distinct, and the words not so abbreviated as to be unintelligible or susceptible of more than one meaning. Attention to these points will prevent the occurrence of mistakes in compounding the medicine.

3. The doses should neither be large enough nor close enough together (in the case of powerful medicines) to cause injurious effects. It is better to give too little than too much.

4. Medicines which form poisonous compounds (as calomel and sodium chloride) should not be combined in the same prescription.

5. Remedies should not be combined (except for particular purposes) which are physiological antagonists, *i. e.*, which by their actions on the body render each other inert.

6. Remedies should not be combined for internal administration which are chemically incompatible, *i. e.*, which will decompose or precipitate each other.

7. The prescription should be as simple as possible, and contain as few ingredients as the nature of the case will allow.

8. It is better not to order a larger quantity of medicine than the patient will probably require.

9. Never send out a prescription without having carefully reread it, to be certain no mistake has been made.

10. Never give a patient a prescription which has been corrected. If a mistake has been made, rewrite the prescription entirely.

Of what parts does a prescription consist?

A prescription consists of four parts:—

1st. The *superscription* (*super*, "over," and *scribo*, "I write"), which consists of the sign ℞ (which is possibly an abbreviation for *Recipe*, "take"), and in some cases the name and address of the patient, with the date.

2d. The *inscription*, the body of the prescription, containing the names of the drugs which are to be used, with the amount of each.

3d. The *subscription* (*sub*, "under," and *scribo*, "I write"), the directions to the apothecary regarding the preparation of the medicine.

4th. The *signature*, commencing with *S.* or *Sig.* (*Signa*, "write"), and including directions for taking the medicine, the physician's name, and frequently the date, which may be placed here instead of at the beginning of a prescription.

It is customary to write the superscription and signature in English and the inscription and subscription in much abbreviated *medical Latin.*

The *inscription* formerly consisted almost universally of a *basis* (the principal medicine), an *adjuvant* (to aid its action), a *corrective* (to prevent unpleasant effect), and a *vehicle.* Although inscriptions thus formed are still sometimes seen, particularly in purgative prescriptions, yet the tendency to simplicity in prescribing is increasing daily, and prescriptions are often found containing only the basis and the vehicle.

Is a knowledge of Latin necessary in writing a prescription?

A very limited knowledge of Latin is sufficient for ordinary prescription writing, because, owing to the common practice of abbreviating, the last syllable of the Latin words, which varies with the case, is generally omitted.

Describe the method of writing a prescription.

Having written the superscription,* the physician places the names of the drugs which he wishes to administer, in a vertical column under the sign ℞., writing them in Latin and in the genitive case. He next determines how many doses he wishes to prescribe, and multiplying the single dose of each drug by the total number of doses in the prescription, he sets the amount opposite the corresponding medicine, expressing the quantity by the proper signs and numerals if it is written in apothecaries' weight and measure, or by Arabic figures and abbreviations if written in grammes. Thus, having determined to prescribe an iron mixture containing 24 doses, he might write—

℞.	Tincturæ Ferri Chloridi, . .	fʒij	or	8	Gm.
	Acidi Acetici Diluti, ...	fʒj		4	"
	Liquoris Ammonii Acetatis,	fʒj		32	"
	Elixir Aurantii, ...	fʒxiij		52	"

Next comes the directions to the druggist, which in this case is simply to mix the medicines together and which is expressed by the Latin word *misce*, usually abbreviated to M.

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*The patient's name and address and the date are often omitted.

Then follows Sig. or S. (signa), which means the druggist must write what follows on the label, as a direction for the patient, "Take one teaspoonful in water 3 times a day after eating," ending the prescription with the physician's name.

May the above prescription be written in any other way?

Instead of writing "Elixir Aurantii fʒxiij," he may write "Elixir Aurantii *quantum sufficit* f℥iij," which means "as much of the elixir of orange as will suffice (to make the whole mixture measure) f℥iij."

Why are the titles of the drugs written in the genitive case?

The verb "*recipe*" (℞., "take thou") governs not the drug, but the quantity to be taken, which is placed consequently in the accusative case ("take thou two drachms"); the name of the drug *limits* the meaning of the quantity expressed, and according to rule is placed in the genitive case and governed by the amount ("take thou two drachms" of what?—"of the tincture of the chloride of iron").

Given a prescription containing a number of doses of different ingredients, how can a single dose of any one drug be ascertained?

Calculate the number of doses in the mixture and divide the quantity of any ingredient by the number, the result is a single dose.

Thus, the above prescription is a f℥ iij mixture, of which the dose is a teaspoonful or fʒj. As fʒ viij = f℥j, there are 3 times fʒ viij or fʒxxiv in the mixture, consequently 24 doses. To ascertain the amount of tincture of chloride of iron in each dose, convert the quantity of the tincture to minims and divide by 24 : ♏60 = fʒj, therefore ♏120 = fʒ ij ; ♏120 ÷ 24 = ♏v, the quantity of the tincture in a single dose of the mixture.

How many doses should a mixture contain?

A physician should avoid prescribing more of a medicine than his patient will probably want. As a general rule, 24 doses is a sufficient amount, and forms a prescription in which the single doses of the ingredients are easily calculated.

Thus, if the dose be a teaspoonful (fʒj), 24 doses would make a f℥ iij mixture (see above); if, however, the dose is a dessertspoonful (ʒ ij), 24 doses would be twice as much, f℥vj. As ♏iiss × 24 = ♏60 or fʒj, the latter amount represents 24 doses of ♏iiss each, and consequently, if an entire mixture contains 24 doses, fʒj of any of its components will contain 24 doses of ♏iiss.

As solids, when in a thorough state of solution, are equally diffused throughout the menstruum, if ʒj or gr. 60 of any solid is dissolved in 24 doses of a solution, each dose will contain gr.iiss of the solid. Hence, in prescribing—

1st, write for a f℥iij mixture if the dose is to be a teaspoonful (fʒj), or
" f℥vj " " " " dessertspoonful (fʒ ij),

in either case the mixture will contain 24 doses.

2d, recollect that if each dose of such a mixture is to contain gr.iiss or ♏iiss of any substance, there should be ʒj or fʒj of the substance in the mixture;

if each dose should contain gr. v or ♏v, there should be ʒ ij or fʒ ij,
" " " gr. x or ♏x, " " ℥ss or f℥ss,
" " " gr. xx or ♏xx " " ℥j or f℥.

These rules simplify prescription-writing for beginners.

Can any general rule be formulated for dosage of officinal preparations?

As a general rule the *abstracts* may be prescribed in gr. ¼–ss doses. (*Exceptions*, the abstracts of jalap, podophyllum, senega and valerian may be given in gr. x doses.) The *fluid extracts* in ♏x doses. (*Exceptions* (the poisons), the fluid extracts of aconite (♏ss–ij), belladonna (♏j–ij), colchicum root (♏ij–v), seed (♏ij–x), digitalis (♏j–ij), nux vomica (♏j–v), sanguinaria (♏j–v), squill (♏j–ij), stramonium (♏j), veratrum viride (♏j–iv).) *Infusions* and *decoctions* in f℥ss–f℥ij doses. (*Exception*, infusion of digitalis, fʒj–iv.) *Syrups*, fʒj–fʒij doses. (*Exceptions*, syrups of the bromide and of the iodide of iron, ♏v–xxx; compound syrup of squill, ♏x–xxx.) *Tinctures*, ♏v–fʒj doses. (*Exceptions* (the poisons), tinctures of aconite, ♏ij–iij; belladonna, ♏viij–xxx; colchicum, ♏v–xxx; digitalis, ♏v–x; iodine, ♏j–x; ipecac and opium, ♏v–xv; nux vomica, ♏j–x; opium, ♏ij–x; deodorized tincture of opium, ♏ij–x; tinctures of physostigma, ♏v–xv; squill, ♏v–xxx;

stramonium, ♏v–xv; veratrum viride, ♏ij–x.) *Powders*, gr. ij–x; *volatile oils*, gtt. j–ij.

Many preparations can be administered in larger doses than indicated by this general rule.

Mention some circumstances which, by modifying the effects, will influence the dose of medicines.

As the activity of a drug is increased or lessened by the age, sex, idiosyncrasy, constitution and habits of the patient, as well as by the condition of the digestive and absorbent systems, disease, and manner of administration, these circumstances must be considered in relation to dosage.

How does age influence the activity of a drug?

Children and old persons are more readily influenced by most drugs, particularly narcotics, than adults in the prime of life; but, as a rule, they bear larger *proportionate* doses of purgatives. No scheme for calculating the doses from the age of the patient alone can be relied on in practice.

What is Dr. Young's rule for calculating the dose for children?

Convert the child's age into a fraction by using the age itself as a numerator and the age + 12 as a denominator, the result being the proportion of the adult dose which should be administered to the child. Thus, at three years $\frac{3}{3+12}=\frac{3}{15}=\frac{1}{5}$ of that of the adult. At 21 years of age the full dose is given.

What is Dr. Cowling's rule?

Dr. Cowling proposed to divide the patient's *next birthday* by 24; thus, at three years the dose would be $\frac{4}{24}=\frac{1}{6}$ of that of the adult.

How may the dose for a child be more easily calculated in the metric system?

Dr. Lauder Brunton proposes to multiply the next birthday by 4 and divide the result by 100; or, what is the same thing, to multiply the full dose by the child's next birthday, then by 4, and remove the decimal point two places to the left. Thus, if the dose for an adult be 1. Gm., that for a child of 3 years will be $\frac{1\times4\times4}{100}=.160$ Gms.

How do sex, idiosyncrasy, constitution and habits influence medicinal effects?

Men generally bear larger doses of medicines than women; many persons manifest idiosyncrasies with respect to certain drugs; thus, some are very susceptible to the poisonous effects of even minute doses of arsenic; others cannot take quinine or opium or belladonna or the iodides, and in others very dilute solutions of cocaine applied to the mucous membranes may cause alarming symptoms. As a rule, the larger and more robust the individual, the less easily is he influenced by drugs. When a medicine is habitually taken, the system becomes tolerant to it, and larger doses are required to produce any effect. This is especially the case with opium and purgatives.

In what way does the condition of the digestive and absorbent symptoms modify the effects of medicine?

During digestion, larger amounts of medicine are borne than can be taken fasting. In certain conditions of the alimentary canal, as in the third stages of yellow fever and of cholera, during a congestive chill of the gastro-enteric variety, or during profound opium narcosis, absorption from the stomach is slow, if it take place at all.

What effect does disease have upon the influence of medicines on the system?

In certain diseases great tolerance is manifested to medicine; thus, in peritonitis and cerebro-spinal fever enormous doses of opium are taken with advantage; in typhoid fever the tolerance to alcohol is marked.

Does the method of administration modify the effect of medicines?

It does: diuretics act more powerfully when much diluted; saline purgatives when concentrated. Usually medicines act more rapidly and powerfully when given by the mouth than when administered per rectum; still more so when injected under the skin, and most powerfully when injected into the blood.

How may medicines be administered?

Medicines may be administered by the *skin*, being either applied without friction (*enepidermic method*), or with friction (*epidermic* *method*), or else directly to the derma, which has been denuded by means of a blister (*endermic method*). They may also be given *hypodermically*, by means of a small syringe armed with a long, hollow needle. When thus administered, the dose should be from one-half to two-thirds of that which is required by the mouth, and the medicine should be in a thorough state of solution. Medicines are also applied to all the *mucous tracts* in the form of solutions, vapors (by atomization), powders (by insufflation), etc. The gastro-intestinal tract is most generally used when a systemic effect is desired, and the remedy is given either by the mouth or by the rectum. Suppositories and ointments are occasionally used per vaginam for their influence on the system. The broncho-pulmonary mucous membrane is used for the inhalation of vapors, as ether. *Intravenous injection* is rarely practiced except as a last resort.

How are medicines classified?

Medicines are usually classified either according to their physiological action or to their therapeutic uses. The latter is the better arrangement.

The difficulty of grouping medicines is increased by the fact that even as yet the study of pharmacology is in its infancy, so that the exact physiological group to which many of them belong is not definitely determined. The action of most medicines, also, is complex, affecting different organs at the same time, and in many instances varying much according to the dose and the manner of administration.

They may be divided accordingly into—

GROUP 1.—SYSTEMIC MEDICINES.

Class 1.—Medicines acting on the body at large by their influence on digestion, nutrition (tissue waste and repair), and calorification.

Order I. Digestants. *Order II.* Tonics. *Order III.* Alteratives. *Order IV.* Antipyretics.

Class 2.—Medicines acting on the body by their effect on its various organs.

A. On the Nervous System:—

Order I. Hypnotics. *Order II.* Mydriatic Anodynes. *Order III.* Anæsthetics. *Order IV.* Antispasmodics. *Order V.* Excito-motors. *Order VI.* Depresso-motors.

B. On the Organs of Circulation:—

Order I. Stimulants. *Order II.* Sedatives.

C. On the Sexual Organs:—

Order I. Aphrodisiacs. *Order II.* Anaphrodisiacs. *Order III.* Oxytocics. *Order IV.* Uterine Sedatives. *Order V.* Emmenagogues.

D. On the Alimentary Canal:—

Order I. Emetics. *Order II.* Gastric Sedatives. *Order III.* Carminatives. *Order IV.* Cathartics. *Order V.* Anthelmintics.

Class 3.—Medicines Acting on the Various Secretions:—

Order I. Diuretics. *Order II.* Diaphoretics. *Order III.* Expectorants. *Order IV.* Astringents. *Order V.* Antacids.

GROUP 2.—TOPICAL MEDICINES.

Class 1. Antiseptics.

Class 2. Irritants.

Order I. Rubefacients. *Order II.* Vesicants. *Order III.* Suppurants. *Order IV.* Escharotics.

Class 3. Demulcents.

Class 4. Emollients.

Class 5. Protectives.

Class 6. Coloring Agents.

GROUP I.—SYSTEMIC MEDICINES.

Class I.—Medicines Acting on the Body at Large by Their Influence on Digestion, Nutrition (Tissue Waste and Repair) or Calorification.

ORDER I.—DIGESTANTS.

What are digestants?

Digestants are animal or vegetable substances given to aid digestion when the normal alimentary secretions are insufficient for this function.

Name the digestants.

1. *Pepsinum* (*pepsin*—officinal), a ferment obtained from the mucous membrane of the stomach of the pig, sheep or calf.

2. *Ingluvin*, a preparation from the gizzard of the domestic chicken.

3. *Pancreatin*, a ferment obtained from the pancreas of recently killed animals.

4. *Papain*, a ferment obtained from the fruit of Carica papaya (*Nat. Ord.* Papayaceæ), a tree of South America.

5. *Extractum malti* (*extract of malt*—officinal), prepared from the *seed* of Hordeum distichum or barley (*Nat. Ord.*, Graminaceæ).

What are the physiological actions of these substances?

1. *Pepsin* (when combined with an acid) digests albumen, which it converts into albuminose.

2. *Ingluvin* also aids the digestion of albumen, this action being probably due to a bitter principle which it contains and which stimulates the gastric glands.

3. *Pancreatin* (in neutral or alkaline solutions) converts albumen into albuminose and starches into glucose and aids in emulsifying fats.

4. *Papain* digests albumen and dissolves false membranes, ascarides and tænia.

5. *Extract of malt* contains diastase, which aids in converting starch into dextrine and glucose.

What are the therapeutic uses of the digestants?

1. *Pepsin* is useful when the secretion of the peptic glands is not sufficient for the purposes of digestion, as in *atonic dyspepsia*, *apepsia of infants*, *anœmia*, *chlorosis*, *gastric ulcer* and *cancer* and *infantile diarrhœa*. It has been used for the relief of *reflex vomiting*, as that of *pregnancy*. It is an invaluable addition to nutritive enemata, and has been *injected into tumors* to arrest their growth and aid in their absorption.

2. *Ingluvin* is used chiefly for the relief of *vomiting of pregnancy*, also in *indigestion accompanied with flatulency*, and in *acute dyspepsia*.

3. *Pancreatin* is used in *intestinal indigestion*, and to aid in emulsifying fats. It is also added to nutritive enemata.

4. *Papain* is sometimes used in *dyspepsia*, to aid the digestion of albuminous foods, but more frequently for its solvent action on *false membranes* and *tœnia*.

Pepsin, *pancreatin* (under the name of *trypsin*) and *papain* have been successfully used to *dissolve the membranes of croup and diphtheria*. They are used in solution, either in the form of spray or applied by a brush to the part.

5. *Extract of malt* is used in *intestinal indigestion*; also as a tonic in *debility* and in *nervous exhaustion*, and as a *vehicle* for cod-liver oil.

What are the preparations and doses of the digestants?

Pepsinum saccharatum (*saccharated pepsin*), dose gr. v–xx.

Liquor pepsini (*solution of pepsin*) contains saccharated pepsin dissolved in diluted hydrochloric acid, glycerin and water, dose fʒj–iv.

Ingluvin (not officinal) may be given in doses of gr. v–xv.

Pancreatin (not officinal) in doses of gr. v–x.

Papain (not officinal) in doses of gr. j–v.

Extractum malti (*extract of malt*), dose fʒj–iv, after meals.

Name some of the substances which are incompatible with the digestants.

Alcohol and many of the *mineral salts* destroy their properties.

Alkalies (when sufficiently powerful) destroy the action of pepsin and ingluvin, while materially aiding that of pancreatin.

Acids retard and finally destroy the action of pancreatin while aiding those of pepsin and ingluvin.

How and at what time should the digestants be given?

Pepsin and ingluvin should be given with meals, either in solution with an acid or in capsules, powder or compressed pill.

Often they are combined with sodium bicarbonate, to which bismuth is sometimes added, and administered before eating.

Pancreatin is usually given from 2 to 4 hours after meals, combined with an alkali.

Papain is taken after meals, in powder, capsule or compressed pill.

ORDER II.—TONICS.

What are tonics?

Tonics are remedies which, in conditions of debility, impart a gradual and permanent increase of vigor to the body or its various parts, restoring the energy and strength which were wanting.

How may tonics be divided?

They are divided into *vegetable* and *mineral tonics.*

VEGETABLE TONICS.

What subdivisions of vegetable tonics are made?

VEGETABLE TONICS are divisible into *simple or pure bitters, aromatic bitters* and *peculiar bitters.*

Simple Bitters.

Mention the simple bitters.

1. QUASSIA, the *wood* of Picræna excelsa (*Nat. Ord.* Simarubaceæ), a lofty tree of the West Indies.

2. GENTIANA (*gentian*), the *root* of the Gentiana lutea (*Nat. Ord.* Gentianaceæ), a plant of the mountainous portions of Central and Southern Europe.

3. CALUMBA, the *root* of Jateorrhiza calumba (*Nat. Ord.* Menispermaceæ) a plant of the southeastern coast of Africa, and

4. CHIRATA, Ophelia chirata (*Nat. Ord.* Gentianaceæ) a *plant* of India.

What are their chief chemical constituents?

1. *Quassia-wood* contains *quassin*, a neutral bitter principle;

2. *Gentian*, an acid, *gentisic acid* (gentisin); a fixed oil, and a bitter principle, *gentianin* or *gentiopicrin;*

3. *Calumba*, an alkaloid, *berberine* (which is found in many other plants, and has been used as a tonic and febrifuge); a bitter principle, *columbin*, and an acid, *columbic acid;* and

4. *Chirata*, a neutral bitter principle, *chiratin;* and an amorphous acid, *ophelic.*

What are the physiological actions of the simple bitters?

The simple bitters increase the secretions, and impart tone to the mucous membranes; increase the appetite and digestion, and thus promote nutrition and improve the condition of the blood, but when taken continuously for too long a time they disorder digestion and cause gastric catarrh. Gentian, in full doses, by increasing the intestinal secretion, acts as a mild laxative.

Calumba is least likely to disorder the stomach.

What are the therapeutic uses of the simple bitters?

They are given (1) to *increase secretion* and *promote appetite* in *atonic dyspepsia*, in *chronic gastric catarrh* and during *convalescence* from acute diseases. Calumba is the mildest, and, being best adapted to weak stomachs, may be used in *vomiting of pregnancy* and in *sea-sickness;* quassia, gentian and chirata are well adapted to cases of dyspepsia with relaxation or torpor of the mucous membrane and resulting constipation. (2) *To give tone to the mucous membranes*, in *diarrhœa* and in *accumulations of flatus* in the bowel from a relaxed condition, calumba may be used. (3) *As vehicles* for the administration of other medicines, as acids or alkalies. (4) *To destroy ascarides*, an infusion of quassia may be used as an enema.

What are the preparations and doses of these substances?

1. EXTRACTUM QUASSIÆ (*extract of quassia*), dose gr. j–v, principally used as an excipient.

EXTRACTUM QUASSIÆ FLUIDUM (*fluid extract of quassia*), dose ♏v–xx.

TINCTURA QUASSIÆ (*tincture of quassia*), f ʒj–ij.

Quassin (not officinal), dose gr. ¼–ss.

2. Extractum Gentianæ (*extract of gentian*), dose gr. j–xxx.

Extractum Gentianæ Fluidum (*fluid extract of gentian*), dose fʒss–j.

Tinctura Gentianæ Composita (*compound tincture of gentian*), dose fʒss–ij.

3. Extractum Calumbæ Fluidum (*fluid extract of calumba*), dose fʒss–j.

Tinctura Calumbæ (*tincture of calumba*), dose fʒss–ij.

Berberine (not officinal), dose gr. j–x, as a sulphate or hydrochlorate.

4. Extractum Chiratæ Fluidum (*fluid extract of chirata*), dose ♏x–xx.

Tinctura Chiratæ (*tincture of chirata*), dose ♏v–fʒj.

What medicines should not be prescribed with gentian?

Iron sulphate and the salts of silver and of lead are incompatible with gentian.

How and at what time should the simple bitters be given?

The simple bitters are given before eating, either alone or combined with other medicines in pills or in mixtures or solutions.

Aromatic Bitters.

How do the aromatic differ from the simple bitters?

The aromatic bitters are more *stimulating* to the mucous tract than the simple bitters, because of the aromatic volatile oils which they contain; they also contain tannic or gallic acid, which renders them more or less *astringent.*

Mention the aromatic bitters.

1. Serpentaria (*Virginia snakeroot*), the *rhizome* and *rootlets* of Aristolochia serpentaria (*Nat. Ord.* Aristolochiaceæ) and other varieties of Aristolochia, indigenous plants;

2. Eucalyptus, the *leaves* of E. globulus or blue gum-tree (*Nat. Ord.* Myrtaceæ), a tree of Australia;

3. Prunus Virginiana, the *bark* of P. serotina or wild cherry (*Nat. Ord.* Rosaceæ), an indigenous tree;

4. Anthemis, the *flower-heads* of A. nobilis or chamomile (*Nat. Ord.* Compositæ), a native of Europe;

5. MATRICARIA, the *flower-heads* of M. chamomilla or German chamomile (*Nat. Ord.* Compositæ);

6. EUPATORIUM, the *leaves* and *flowering tops* of E. perfoliatum, boneset or thoroughwort (*Nat. Ord.* Compositæ), a common indigenous plant;

7. MAGNOLIA, the *bark* of M. glauca and other species of magnolia (*Nat. Ord.* Magnoliaceæ), indigenous trees;

8. CASCARILLA, the *bark* of Croton Eluteria (*Nat. Ord.* Euphorbiaceæ), a small tree of the West India Islands; and

9. ABSINTHIUM, the *leaves* and *tops* of Artemisia Absinthium or wormwood (*Nat. Ord.* Compositæ), a European plant.

What are the chief chemical constituents of the aromatic bitters?

They all contain a *volatile oil*, a *bitter principle*, *resin* and *tannic acid.*

The *volatile oil of eucalyptus* is composed of two terpenes, cymol and eucalyptol; that of *Prunus Virginiana* contains hydrocyanic acid, which is formed by the reaction in water of a peculiar ferment (not emulsin) existing in the bark, with the bitter principle; that of *absinthium* contains absinthol.

The *bitter principle of serpentaria* is called *aristolochin;* that of *anthemis, anthemic acid;* that of *eupatorium*, *eupatorin;* that of *magnolia* (only found in M. umbrella), *magnolin;* that of *cascarilla*, *cascarillin*; and that of *absinthium*, *absinthin.*

What are the physiological actions of the aromatic bitters?

Owing to the bitter principles which they contain, their action on digestion, nutrition and secretion is similar to that produced by the simple bitters. They have, in addition, a stimulating influence on the mucous membranes, due to the volatile oils (which are eliminated by the bronchial mucous membrane, skin and kidneys, and increasing their secretions are, somewhat, expectorants, diaphoretics and diuretics), and an astringent effect, owing to their tannic acid. In large doses they are emetic and laxative. *The oil of eucalyptus* destroys germs, and is an irritant when applied locally. It quickens the pulse and respiration and lowers the blood pressure. In large doses it causes diarrhœa. *Prunus Virginiana* has a sedative influence over the pneumogastric nerve, from the hydrocyanic acid which is developed in it, and thus quiets cough. *Absinthium* in large doses, or when habitually used in the form of the *liqueur* (*absinthe*), produces epileptiform convulsions.

What are the therapeutic uses of the aromatic bitters?

They are used for the same purposes as the simple bitters.

Serpentaria is used as a *cardiac stimulant* and *tonic* in low fevers, and occasionally as a *stimulating expectorant* in capillary bronchitis and low pneumonias. *Eucalyptus* is used in *chronic catarrhal conditions* of the gastric, broncho-pulmonary, and genito-urinary, mucous membranes, and from its *destructive influence on germs* it is of benefit in vomiting due to sarcina ventriculi. As an *antimalarial* agent, it is far inferior to cinchona. As a *local* appplication, it is employed in stomatitis. *Prunus Virginiana* is also used as a *stomachic tonic*, but is especially employed as a *cough-relieving agent* in bronchial catarrh and in phthisis.

What are the preparations and doses of these substances?

1. Extractum Serpentariæ Fluidum (*fluid extract of serpentaria*), dose f ʒss–j.

Tinctura Serpentariæ (*tincture of serpentaria*), dose f ʒj–ij.

2. Extractum Eucalypti Fluidum (*fluid extract of eucalyptus*), dose f ʒj.

Oleum Eucalypti (*oil of eucalyptus*), dose gtt. v–x (in capsules or in emulsion).

3. Extractum Pruni Virginianæ Fluidum (*fluid extract of prunus virginiana*), dose f ʒj–ij.

Infusum Pruni Virginianæ (*infusion of prunus virginiana*), dose f ℥ss–ij.

Syrupus Pruni Virginianæ (*syrup of prunus virginiana*), dose f ʒj–f ℥ss.

4 and 5. There are no officinal preparations of *anthemis and matricaria*, the latter of which is not much used in this country. They are usually given in infusion (chamomile tea) in doses of f ℥ij, t. d., as a stomachic tonic.

6. Extractum Eupatorii Fluidum (*fluid extract of eupatorium*), dose f ʒj.

7, 8 and 9. *Magnolia*, *cascarilla* and *absinthium* may be given in infusion. There are no officinal preparations.

At what time should the aromatic bitters be administered?

They should be given shortly before meals when intended to promote appetite and digestion, but when given for their effects on the bronchial or vesical mucous membranes, or for their action on the heart, they should be given between meals.

Peculiar Bitters.

What are the peculiar bitters?

They are such bitters as, owing to peculiarity of action, cannot be classed with either of the preceding groups.

Name the peculiar bitters.

Cinchona, cornus, salix and hydrastis.

CINCHONA.

What is cinchona?

Cinchona is the *barks* of all species of Cinchona (*Nat. Ord.* Rubiaceæ), which contain at least 3 per cent. of its peculiar alkaloids.

What is the habitat and principal varieties of cinchona?

The cinchona trees are natives of the mountainous regions of the western parts of S. America, from 22° south latitude to 10° north latitude, but have been successfully cultivated in India, Ceylon, Java, the West Indies and other parts of the world. The two principal varieties are *cinchona calisaya* from which is derived the *cinchona flava* (yellow or calisaya bark) and the *cinchona succirubra*, whence comes the *cinchona rubra* (red bark). Other varieties are *C. micrantha* and *C. condaminea*, from which is obtained *cinchona pallida* or pale bark, no longer officinal.

How is the bark obtained?

The bark was formerly obtained by stripping the trees, but as this killed them and threatened to extinguish the genus, the present method has been adopted. One-fifth the circumference of the tree is denuded of bark in longitudinal strips each year, in the dry season, for five years, at the end of which time the bark has again grown over the portion first denuded. The process is then repeated.

What are the chemical constituents of cinchona?

The most important constituents are the alkaloids *quinine* and *cinchonine*, of which the former is found to preponderate in the yellow bark, the latter in pale barks, and both exist in about equal proportions in red bark. Other important alkaloids are *quinidine* and *cinchonidine*. Combined with these alkaloids are *kinic*, *kinovic*, *cinchotannic* and *kinovo-tannic acids*. Other less important alkaloids are also found, as *aricine*, *paricine*, *quinamine* and *paytine*. *Quinicine* and *cinchonicine* are amorphous modifications of quinine and cinchonine.

Describe a chemical test for the cinchona alkaloids.

If *quinine and quinidine, or their salts*, are treated with fresh chlorine-water, an emerald-green precipitate will form when ammonia-water is added. When the same test is applied to *cinchonine, cinchonidine, or their salts*, a white precipitate results.

What are the physiological effects of cinchona and its alkaloids?

Locally cinchona and its alkaloids are irritant and antiseptic, destroying minute organisms or inhibiting their movements.

Internally it acts on the *alimentary canal* as a simple bitter, in small doses increasing the appetite and digestion; if long continued, producing indigestion and gastric catarrh. In ordinary doses cinchona constipates. In large doses cinchona or its alkaloids irritate the mucous membrane and cause vomiting and diarrhœa.

Nutrition is stimulated and the excretion of waste products increased by small doses; large doses, however, diminish the amount of urea and uric and phosphoric acids in the urine. In malarial fever the products of waste tissue are much increased.

In the *blood* it interferes with the oxygen-carrying function of the red corpuscles, and diminishes the number, inhibits the movements, and prevents the migration of the white corpuscles, both in health and disease.

Circulation: in small doses the cardiac action is increased; large doses, by acting on the cardiac motor ganglia, depress the heart, sometimes causing it to intermit, and finally arrest it in diastole; the blood pressure is lowered.

The *temperature* in health is very slightly, if at all, influenced; in fevers a rapid decline takes place, due to the action on the blood and circulation.

Nervous system; small doses stimulate the cerebral functions; large doses cause *cinchonism* (*i. e.*, a constricted feeling in the forehead; giddiness and tinnitus aurium, with impairment of hearing and sometimes of vision); after toxic doses these symptoms are aggravated and delirium, weak pulse, coma (sometimes convulsions), and in rare cases death, supervene. It probably reduces the reflex excitability of the spinal cord, and although it never causes, may energize uterine contractions when present. *Elimination* takes place chiefly by the urine, the greater portion escaping from the system within eight hours.

Cutaneous eruptions, as erythema, urticaria or herpes are produced in some subjects by even small doses of cinchona or its alkaloids.

What are the therapeutic uses of cinchona and its alkaloids?

1. *As a tonic.* The cinchona preparations, as well as the salts of its alkaloids, are largely used to improve the appetite and digestion in *debility*, the *latter stages of inflammations* and in *convalescence* from acute diseases generally, also in *atonic dyspepsia* (combined with a mineral acid), in *relaxed conditions* of the alimentary mucous membrane and in *summer complaint* of children. The alkaloids are also used as tonics to sustain the vital forces in *diphtheria*, *erysipelas*, *pyæmia*, *septicæmia* in all *typhoid conditions*, in the *eruptive fevers*, and in *surgical shock.* In the various *neuralgiæ* combined with other remedies (as morphine or belladonna, iron or arsenic), it is a valuable agent. From its influence on the migration of leucocytes and on cell proliferation it is used (in larger doses) in the *early stages of inflammation.*

2. *As an antipyretic* in all conditions of hyperpyrexia quinine may be used in large doses, repeated in about six or eight hours to maintain its effects, but the newer and more powerful antipyretics have argely superseded this practice.

3. *As an antiperiodic*, cinchona has no rival in the materia medica. The salts of the alkaloids are preferred for this purpose. Quinine may be used as a *prophylactic* against malaria in small doses, given early in the morning (gr. iij–x). In the treatment of *intermittent* (gr. x during the sweating stage, repeated five hours before the next paroxysm is expected), *remittent* (gr. xxx per day in two doses, given

at any time), *hemorrhagic* and *pernicious malarial fevers* (gr. xx–ʒj, administered promptly by the mouth or rectum or even subcutaneously), it acts as a specific. It is useful also in malarial cachexia, but must often be combined or alternated with arsenic and other treatment.

4. *Locally*, quinine may be applied in solution as an astringent and antiseptic to the nares in *summer catarrh*, etc., or to the mouth in *muguet*.

What are the preparations and doses of cinchona and its alkaloids?

EXTRACTUM CINCHONÆ (*extract of* (yellow bark of) *cinchona*), dose as a *tonic* gr. x–xxx.

EXTRACTUM CINCHONÆ FLUIDUM (*fluid extract of* (yellow bark of) *cinchona*), dose as a tonic fʒj.

TINCTURA CINCHONÆ (*tincture of* (yellow bark of) *cinchona*), dose fʒj–iv.

TINCTURA CINCHONÆ COMPOSITA (*compound tincture* (Huxham's) *of cinchona*), containing red bark, serpentaria, bitter orange peel, glycerin, alcohol and water, dose fʒj–iv.

INFUSUM CINCHONÆ (*infusion of cinchona*), containing aromatic sulphuric acid, dose f℥iss–ij.

QUININÆ SULPHAS (*quinine sulphate*), the basic sulphate, not very soluble in water, but rendered more soluble by the addition of diluted sulphuric acid, dose as a *tonic*, gr. j–vj; as an *antipyretic*, gr. x–xx, repeated as indicated; as an *antiperiodic*, gr. xvj–xx, or more.

QUININÆ BISULPHAS (*quinine bisulphate*), the normal sulphate, more soluble, but containing less quinine than the basic sulphate, and given in slightly larger doses.

QUININÆ HYDROBROMAS (*quinine hydrobromate*), better adapted for hypodermic injection than the sulphates; dose, by the mouth, the same as of quinine sulphate, a little less when used hypodermically.

QUININÆ HYDROCHLORAS (*quinine hydrochlorate*), also adapted for subcutaneous use; dose, as of the preceding preparations.

QUININÆ VALERIANAS (*quinine valerianate*), dose gr. j–vj.

QUINIDINÆ SULPHAS (*quinidine sulphate*), dose slightly larger than those of quinine.

CINCHONINÆ SULPHAS (*cinchonine sulphate*), dose ⅓ larger than those of quinine

CINCHONIDINÆ SULPHAS (*cinchonidine sulphate*), dose gr. j–xv, according to the effects desired.

CHINOIDINUM (*chinoidin* or *quinoidin*), a resinous mass containing a mixture of the cinchona alkaloids, mostly in an amorphous state; dose twice as large as of quinine sulphate.

What medicines are incompatible with cinchona?

The *alkalies* and *alkaline earths* precipitate the alkaloids of cinchona; *tannic*, *gallic* and *tartaric acid*, the *tincture* and the *compound solution of iodine* form insoluble compounds with them; and the *ferric salts* precipitate cincho-tannic acid from the preparations of cinchona.

How are cinchona and its alkaloids administered?

The preparations of *cinchona* are frequently combined with the mineral acids or administered alone as tonics; the alkaloids are given in solution, freshly made pills or capsules, or may be made into suppositories, or used subcutaneously. They are often combined with iron, arsenic and other medicines. Saccharin is said to disguise their unpleasant taste.

CORNUS.

What is cornus?

Cornus is the *bark* of the *root* of C. florida or dogwood (*Nat. Ord.* Cornaceæ), an indigenous tree.

What chemical principles does it contain?

It contains *cornin* or *cornic acid*, resin, tannic and gallic acids, etc.

What are its physiological actions?

Its effects are those of a simple bitter, but as it contains tannic and gallic acids, it is also an astringent. It often disorders the stomach.

What are the therapeutical uses of cornus?

Cornus may be used to fulfill the indications of the bitters generally, and is also used as an antiperiodic, being inferior to cinchona, but ranking next to it among the bitters.

What are its preparations and doses?

EXTRACTUM CORNÛS FLUIDUM (*fluid extract of cornus*), dose fʒj.

SALIX.

What is salix?

Salix is the *bark* of S. alba, or white willow, and other species of salix (*Nat. Ord.* Salicaceæ).

What are its chief chemical ingredients?

It contains *salicin*, a neutral principle.

What are its physiological effects?

The effects of *salix* are those of the bitter tonics generally. In large doses it disorders digestion and causes vomiting. *Salicin* acts similarly but more slowly and less powerfully than salicylic acid (*q.v.*) both as an antifermentative, antiseptic and antipyretic. It does not depress the circulation to the same extent, and is believed not to possess toxic properties. It is eliminated by the urine (chiefly as salicylic and salicyluric acids) and by the perspiration, rendering both of these excretions alkaline.

What are the therapeutical uses of salix and salicin?

Salix is little used. It may be given as a tonic and has also been used as an antiperiodic. *Salicin* is used as an *antiperiodic* in *malarial affections*; as an *antipyretic* it ranked next to quinine, but has been largely superseded by other agents. In *rheumatism* it may be used instead of salicylic acid, acting more slowly but with less gastro-intestinal disturbance.

What are the doses of salix and salicin and how may they be prescribed?

There are no officinal preparations. *Salix* is given as a *tonic* in doses of gr. x–xx; as an *antiperiodic* ʒj, usually in infusions. *Salicin* (officinal) as an *antiperiodic* in doses of gr. x–ʒj; in rheumatism, gr. iij–xv every one, two or three hours in pill, capsule or mixture.

HYDRASTIS.

What is hydrastis?

HYDRASTIS is the *rhizome* and *rootlets* of H. canadensis, yellow root or golden seal (*Nat. Ord.* Ranunculaceæ), an indigenous plant.

What alkaloids does it contain?

It contains *hydrastine* (not hydrastin, which is an eclectic preparation) and *berberine*.

What are its physiological actions?

It acts on the appetite, digestion, nutrition and secretions like the simple bitters; it increases the secretions, especially of the glandular appendages of the intestine and probably that of the liver; when given to animals in sufficient doses, it is said to act on the nervous system like strychnine, but less powerfully, stimulating the reflex centres of the spinal cord, heightening the irritability of the motor nerves and causing incoördination, tremor, convulsions, and, finally, death from tetanic spasm of the respiratory muscles. It is also claimed that it always provokes uterine contractions.

What are the therapeutical applications of hydrastis?

It is used as a tonic, to promote appetite, digestion, and nutrition in *atonic dyspepsia* and *chronic gastric catarrh.* From its effects on secretions, it is used in *catarrhal jaundice*, and in *constipation* from deficient secretion, and as a *diuretic* and *blennorrhetic* in *chronic interstitial nephritis* and *chronic cystitis.* It has also been recommended internally to check uterine hemorrhage. As an antiperiodic in *intermittent fever* and *chronic malaria* it is inferior to quinine.

Locally, it has been used as an application to sore mouth, fissured nipples, sores and ulcers generally, and as an injection in gleet and vaginal leucorrhœa.

What are the preparations and doses of hydrastis?

EXTRACTUM HYDRASTIS FLUIDUM (*fluid extract of hydrastis*), dose ♏v–fʒiv; as a stomachic tonic, ♏v–xv before meals.

TINCTURA HYDRASTIS (*tincture of hydrastis*), dose ♏x–fʒj.

MINERAL TONICS.

Name the mineral tonics.

The MINERAL TONICS are the *preparations of iron* and of *manganese* (which are sometimes classed separately as *hæmatinics* or blood medicines), *phosphorus*, *zinc phosphide*, the *mineral acids*, and *lactic acid*, although of animal origin, is usually considered in connection with the latter.

FERRUM—IRON.

What is the source of iron?

Iron is the most common of all the metals, and is found widely distributed both in the metallic state and as oxide, sulphide, carbonate, phosphate, etc.

What are the physiological effects of iron?

Metallic iron is inert, but when swallowed it is dissolved by the acid of the stomach, and forms salts. It probably enters the blood as an albuminate. Any iron which is not absorbed passing into the intestines, is converted into a sulphide, and colors the stools black. Iron exists normally in the red corpuscles of the blood in the proportion of 1 part of iron to 230 parts of corpuscles. When deficient in the blood, under a course of iron the number of corpuscles increase, the blood is improved in quality, and consequently the tissues are better nourished and all the functions of the body are better performed. In appropriate cases it promotes the appetite and digestion by stimulating the gastric glands, but if given for too long a time it disorders digestion.

The *more soluble preparations* of iron, if given in large doses, cause nausea and vomiting; its *salts*, *with the mineral acids* and *with iodine*, possess more or less toxic properties.

The *sulphates*, *nitrates* and *chlorides* of iron are astringent, diminishing the secretions of the mucous membranes, thus causing constipation, and coagulating albumen, thus proving hæmostatic. Iron is eliminated by the fæces, bile and urine.

What are the therapeutic uses of iron?

1. *As a general tonic* to improve the appetite and digestion, when it should be combined with a purgative, as aloes.

2. *To improve the condition of the blood* and aid nutrition, in *anæmia* and *chlorosis;* in *malarial anæmia* (with quinine); in *various cachexiæ*, as the scrofulous, strumous or syphilitic (iodides); in *amenorrhœa*, *dysmenorrhœa* or *menorrhagia* associated with anæmia; in *fatty degeneration* and in *dilatation of the heart;* in many forms of *neuralgia*, and in many *nervous affections* associated w[illegible] *epilepsy* or *chorea;* in *convalescence* from acute [illegible] *exhausting hemorrhages.* In *erysipelas* iron is

almost a specific (tincture of the chloride ♏xx–xxx every 2 or 3 hours), and in diphtheria it is also useful.

3. *As an astringent* it is sometimes used internally in *chronic diarrhœa* and in dysentery. In *chronic albuminuria* it is useful both as a tonic and astringent.

4. *As a hæmostatic*, in all *passive hemorrhages* in the anæmic (tincture of the chloride), and in hemorrhages from the lungs, stomach, bowels or kidneys (subsulphate, tersulphate or nitrate in drop doses largely diluted and frequently repeated).

5. *Locally* it is employed as a *styptic* (subsulphate), to check the *bleeding from hemorrhoids* and *leech bites*, or to arrest *capillary oozing* from a large surface; in the form of spray in *epistaxis*, and *hæmoptysis*, and it is sometimes injected into the cavity of the uterus (more or less dangerous) to check bleeding from that organ. As an *astringent*, it is applied to syphilitic vegetations (Monsel's solution) and as an injection (largely diluted) in gonorrhœa and leucorrhœa.

What are the preparations of iron and their doses?

FERRUM REDUCTUM (*reduced iron—Quevenne's iron*), an impalpable powder of metallic iron, well borne by the stomach, and not astringent; dose gr. j–v.

FERRI OXIDUM HYDRATUM (*hydrated ferric oxide*) and FERRI OXIDUM HYDRATUM CUM MAGNESIA (*hydrated ferric oxide with magnesia*), used almost exclusively as antidotes in arsenical poisoning; dose f℥ss, every 5 or 10 minutes.

TROCHISCI FERRI (*troches of iron*), each lozenge contains of ferric hydrate gr. v.

EMPLASTRUM FERRI (*plaster of iron*) contains ferric hydrate, lead plaster, Burgundy pitch and Canada turpentine.

FERRI CARBONAS SACCHARATUS (*saccharated ferrous carbonate*), dose gr. ij–x.

MASSA FERRI CARBONATIS (*mass of ferrous carbonate—Vallet's mass*), dose gr. iij–v.

MISTURA FERRI COMPOSITÆ (*compound iron mixture—Griffith's anti-hectic mixture*), dose, in anæmia or chlorosis, f℥ss–ij.

PILULÆ FERRI COMPOSITÆ (*compound iron pills*), dose 1 or 2 pills t. d.

Ferri Sulphas (*ferrous sulphate—green vitriol* or *copperas*). One of the most active and astringent preparations of iron. It is irritant to the stomach, and in overdoses a poison. It is used locally as a styptic and astringent, and in solution to disinfect privies and drains; dose gr. ss–ij (in pill).

Ferri Sulphas Exsiccatus (*dried ferrous sulphate*), ferrous sulphate deprived of its water of crystallization; dose gr. ½–ij.

Ferri Sulphas Præcipitatus (*precipitated ferrous sulphate*), dose gr. j–v.

Liquor Ferri Tersulphatis (*solution of iron tersulphate*), a solution of normal ferric sulphate; rarely used except in making hydrated ferric oxide.

Liquor Ferri Subsulphatis (*solution of iron subsulphate—Monsel's solution*), a solution of basic ferric sulphate. It may be given internally, largely diluted, as a hæmostatic; dose ♏j–x. It is chiefly used locally as a styptic.

Ferri Chloridum (*ferric chloride*), rarely used internally; dose gr. j–ij.

Liquor Ferri Chloridi (*solution of ferric chloride*), dose ♏ij–v, largely diluted; externally it is used as a styptic.

Tinctura Ferri Chloridi (*tincture of ferric chloride*), one of the best preparations of iron for internal use. It possesses diuretic properties; dose ♏v–xxx.

Mistura Ferri et Ammonii Acetatis (*mixture of iron and ammonium acetate—Basham's mixture*), an excellent preparation, combining tonic and diuretic properties, very valuable in chronic desquamative nephritis and chronic dropsies generally; dose f℥ss–j.

Ferri Iodidum Saccharatum (*saccharated ferrous iodide*), dose gr. iij–x.

Syrupus Ferri Iodidi (*syrup of ferrous iodide*), dose ♏v–xxx.

Pilulæ Ferri Iodidi (*pills of ferrous iodide*), dose 1 to 3 pills.

Syrupus Ferri Bromidi (*syrup of ferrous bromide*), dose ♏v–xxx.

Ferri Phosphas (*ferric phosphate*), dose gr. ij–v.

Ferri Pyrophosphas (*ferric pyrophosphate*), dose gr. ij–v.

Ferri Hypophosphis (*ferric hypophosphite*), dose gr. v–x.

Liquor Ferri Nitratis (*solution of ferric nitrate*), used internally as an astringent and hæmostatic; dose ♏ij–v, freely diluted.

Ferri Citras (*ferric citrate*), dose gr. ij–x.

Liquor Ferri Citratis (*solution of ferric citrate*), dose ♏ij–x.

Ferri Oxalas (*ferrous oxalate*), agrees well with the stomach, dose gr. ij–v.

Liquor Ferri Acetatis (*solution of ferric acetate*), rarely used internally, dose ♏x–xxx.

Tinctura Ferri Acetatis (*tincture of ferric acetate*), dose ♏x–xxx.

Ferri Lactas (*ferrous lactate*), a mild chalybeate, agreeing well with the stomach, and useful in anæmia and chlorosis, with weak digestion; dose gr. ij–x.

Ferri Valerianas (*ferric valerianate*), dose gr. j–iij.

Ferri et Potassii Tartras (*iron and potassium tartrate—potassio-tartrate of iron*), may be prescribed with alkalies; dose gr. ij–x.

Ferri et Ammonii Tartras (*iron and ammonium tartrate*), a mild preparation, dose gr. ij–x.

Ferri et Ammonii Sulphas (*iron and ammonium sulphate—ammonio-ferric alum*) is given internally as an astringent in chronic diarrhœa and dysentery, dose gr. j–v.

Ferri et Ammonii Citras (*iron and ammonium citrate*), dose gr. ij–v.

Vinum Ferri Citratis (*wine of iron citrate*), dose f ʒj.

Ferri et Quininæ Citras (*iron and quinine citrate*), dose gr. j–v.

Liquor Ferri et Quininæ Citratis (*solution of iron and quinine citrate*), dose f ʒj.

Vinum Ferri Amarum (*bitter wine of iron*), dose f ʒj–ij.

Ferri et Strychninæ Citras (*iron and strychnine citrate*), dose gr. ij–iij.

Syrupus Ferri Quininæ et Strychninæ Phosphatum (*syrup of iron, quinine and strychnine phosphates*), dose f ʒj.

What medicines are incompatible with the iron preparations?

I. *The alkaline preparations of iron* are incompatible with the acids and acidulous salts.

II. *The salts formed by mineral acids with iron*, with the alkalies and alkaline earths and their carbonates.

III. *The iodides, bromides and salts containing vegetable acids*, with the alkalies and alkaline earths and their carbonates, and with acids and (other) acidulous salts.

IV. *All the iron preparations*, with substances containing tannic or gallic acids, hence they cannot be prescribed with any of the vegetable tonics except the simple bitters.

When and how should iron be administered?

The fluid preparations should all be given freely diluted. The solid preparations may be given combined with other remedies in pilular form or in solution. Iron causes less gastric irritation and enters the blood more readily if given with or immediately after meals. If gastric irritability is present in anæmia, a course of bitters with the acids had better precede the administration of iron, which, as these symptoms subside, may be given in the form of the lactate, followed by the bitter wine, and finally by the dried sulphate with arsenic in pill, or by the tincture of the chloride. In anæmia iron should be given in rapidly increasing doses until headache, flushing of the face, and some nausea supervene, when the dose should be diminished or the medicine withheld for a few days. It is important to overcome the resulting constipation by occasional laxatives.

MANGANUM—MANGANESE.

What are the sources of manganese?

Manganese is obtained from the native (impure) black oxide, and also from the carbonate.

What are its physiological actions?

Manganese exists normally in the blood, hair, bile, etc., associated with iron; the proportion to iron in the red corpuscles being as 1 to 20. Given internally in small doses, it improves the appetite, digestion and nutrition; in larger doses, it depresses the heart's action and lowers the blood pressure; if large doses are given for some time, the effects resemble those of zinc (wasting and feebleness, staggering gait, and finally paraplegia). In toxic doses it is a gastro-intestinal irritant. The *sulphate* is an emeto-cathartic and cholagogue. *Potassium permanganate* is a powerful oxidizing agent, and hence an antiseptic. It increases the menstrual flow.

For what medicinal purposes is manganese used?

It has been used (1) *to improve the condition of the blood* in *anæmia* and *chlorosis* and in *various cachexia*, either combined with iron or as a substitute for it; (2) *to improve the appetite and digestion* in *gastrodynia* and *pyrosis;* (3) *as a cholagogue* in *jaundice* when of malarial origin (sulphate); (4) *as an antidote to snake bites* and other animal poisons (potassium permanganate internally and locally); (5) in *amenorrhœa* (potassium permanganate); and (6) *locally* as a *disinfectant* and to *correct fetor* in *scarlatina* and *diphtheria* (permanganate as a gargle), or applied to *cancerous or other ulcers*, *abscesses*, *otorrhœa*, etc.

What are the preparations and doses of manganese?

MANGANI OXIDUM NIGRUM (*manganese black oxide*), dose gr. j–x, in pill, powder or capsule.

MANGANI SULPHAS (*manganese sulphate*), dose gr. j–v.

POTASSII PERMANGANAS (*potassium permanganate*), dose gr. ss–ij, in distilled water, in capsule, or made into pill, with kaolin.

What medicines are incompatible with manganese?

The salts of lead, silver, and mercury, and the caustic alkalies are chemically incompatible with the manganese preparations.

PHOSPHORUS.

What is the source from which phosphorus is obtained?

Phosphorus is obtained from the calcium phosphate of bones.

What are the physiological effects of phosphorus?

Phosphorus exists normally in nervous tissue and in the bones. *Locally* applied, phosphorus causes inflammation, ulceration, and even gangrene of the skin. *The vapor*, when inhaled, irritates the mucous membrane, and if caries of the teeth exist, may cause caries or necrosis of the maxillæ.

In medicinal doses, phosphorus increases the *appetite and digestion* (if too long continued, it disorders digestion), and causes eructations of hydrogen phosphide; increases *nutrition*, the *cardiac action* and cutaneous circulation, *mental activity*, *sexual activity*, the formation of the *compact tissue of bone*, and the excretion of phosphates by the *urine.* It is *eliminated* by the liver, kidneys, mucous membrane and skin.

What are the toxic effects of phosphorus?

From 1 to 3 hours after a poisonous dose has been swallowed, violent *epigastric pains* occur, followed by nausea and *vomiting* (the vomited matter *smelling of phosphorus* and being *luminous in the dark*); *vomiting of blood* occurs at a later period; violent purging takes place if the phosphorus passes into the bowel. *Jaundice* may supervene after several days if the patient lives. The pulse is at first strong, soon becoming feeble and rapid. There is great thirst, restlessness, anxiety, noisy delirium or coma and death, preceded by convulsions. The *urine* is diminished, contains albumen, blood, and (after jaundice occurs), biliary pigment. After death, acute fatty degeneration of various viscera, as the liver, kidneys, heart and the walls of the arterioles and capillaries is found: the red corpuscles are altered in form and the blood contains much fat.

What is the treatment of acute poisoning by phosphorus?

1. Give *cupric sulphate* gr. v at once as an emetic and as an antidote (forming a less soluble phosphide).
2. Give *hydrated magnesia* as a purgative.
3. Continue the use of *cupric sulphate* in small doses (gr. $\frac{1}{12}$ every fifteen or twenty minutes) as an antidote or emetic, or, better, give *turpentine* (French acid turpentine or old common, crude turpentine which forms with phosphorus an almost insoluble spermaceti-like mass) as soon as possible, to neutralize the poison.
4. Give *opium* to counteract the general depression.
5. If the blood is much damaged, transfusion should be resorted to.
6. Never, under any circumstances, give any oils (except turpentine) or fats, as they increase the solubility of phosphorus.

What are the medicinal uses of phosphorus?

Phosphorus is used as a *tonic to promote nutrition*: (1) In various nervous affections associated with anæmia, as, *cerebral exhaustion*, *locomotor ataxia*, *paralysis agitans*, and the various *neuralgiæ*; (2) in general diseases, as, *osteomalacia*, *rickets* and *pernicious anæmia*;

(3) in *functional impotence*, and (4) as a substitute for arsenic in certain skin diseases, as *lupus* and *psoriasis*.

What are the preparations of phosphorus and their doses?

Pilulæ Phosphori (*pills of phosphorus*); each pill contains gr. $\frac{1}{100}$ of phosphorus; dose j–v pills, t. d.

Oleum Phosphoratum (*phosphorated oil*) contains phosphorus (1 per cent.) dissolved in ether and almond oil; dose ♏j–v.

Zinci Phosphidum (*zinc phosphide*) is identical in its actions and uses with phosphorus, but not so active; dose gr. $\frac{1}{20}$–$\frac{1}{12}$, or even $\frac{1}{4}$, given in pill or granule.

What medicines are incompatible with phosphorus?

Hydrated magnesia, lime-water, cupric sulphate, powdered charcoal and oil of turpentine are chemically incompatible with it.

What substances aid its absorption?

The oils and fats.

What caution should be observed in prescribing it?

Great care should be taken, especially when large doses are prescribed, that the remedy be not administered for a long period continuously, for fear of causing fatty degenerations of the visceræ.

Mineral Acids.

What are the general effects of the acids and alkalies upon secretions?

Law I. *Acids* increase *alkaline* secretions.
Law II. *Acids* decrease *acid* secretions.
Law III. *Alkalies* increase *acid* secretions.
Law IV. *Alkalies* decrease *alkaline* secretions.

How may these laws be applied to the treatment of digestive disturbances?

1. *To decrease excessive acidity of the gastric juice*—
   (*a*) Give an acid before meals to diminish its secretion, or
   (*b*) An alkali after meals to neutralize the acid present.

2. *To increase the acidity of the gastric juice when it is deficient in that quality*—

(*a*) Give an alkali before meals to increase the secretion of acid, or

(*b*) An acid after meals to supply the deficiency.

Name the mineral acids.

The mineral acids are *sulphuric*, *nitric*, *hydrochloric*, *nitro-hydrochloric* and *phosphoric*.

What are their physiological effects?

Locally the strong acids are *escharotics*, abstracting water from the tissues and combining with the bases. *Sulphuric* and *phosphoric* acids penetrate the tissues more deeply than the others. *Sulphuric* produces a *black*, while *nitric* acid causes a *yellow* eschar.

Internally, in a diluted state and in medicinal doses, they increase the *appetite*, *digestion* and *nutrition* (hydrochloric and phosphoric being more pronounced in their effects). If taken for some time continuously, they diminish the acid of the gastric juice and disorder digestion (sulphuric acid more quickly than the others). Sulphuric acid possesses an astringent influence over the secretions of the skin and bowels; nitric acid, on the contrary, appears to increase the alimentary secretions and that of the liver.

They are *eliminated* by the secretions of the kidneys, bowels and skin. *In large doses* they act as irritant corrosive poisons.

How should poisoning by the mineral acids be treated?

1. Give *alkalies* or *alkaline earths* (tooth powder or soap may be used) to neutralize the acid.

2. Give *eggs*, *milk*, or other *demulcents* to protect the surface.

3. Give *opium* and *nutritive* and *stimulating enemata*, or *intravenous injection* of ammonia, to counteract the resulting depression.

4. As stricture of the œsophagus often follows in these cases if they survive, the passage of an œsophageal bougie should be practiced within 3 or 4 months after the poisoning.

What are the therapeutic uses of the mineral acids?

1. *For their effects on digestion and nutrition.* To prevent excessive formation of acid (both where too much is secreted and where it is formed by fermentation of the food), diluted hydrochloric or phosphoric acid is given before meals; or in *atonic dyspepsia* and *indigestion* due to deficient acid, they may be taken after meals (often

combined with pepsin). *In fevers*, they are used to aid digestion and secretions generally and allay thirst (by stimulating the secretions of the mouth and fauces, thus keeping these parts moist).

2. *For their effects on secretion.* Diluted nitric or nitro-hydrochloric acid is used internally to increase the secretions, and as a bath (f℥iij to water Cj), in *chronic hepatic congestions* and *inflammations*, in *malarial* and *catarrhal jaundice* and in *duodenal catarrh*. As an *astringent in diarrhœas, dysentery* and *cholera* diluted sulphuric acid is given combined with opium; and to arrest profuse sweating diluted or aromatic sulphuric acid may be temporarily employed.

3. *As a hæmostatic* the same agent is often used in uterine or intestinal hemorrhage and occasionally in purpura.

4. *In the treatment of, or as a preventive to, lead poisoning* diluted sulphuric acid is administered (forming an insoluble lead sulphate).

5. *Locally, as an escharotic*, fuming nitric acid may be applied to *chancroids, phagedenic ulcers, hospital gangrene* or *gangrene in wounds.* It is also used to remove *warts*, and as an intra-uterine application in various forms of *endometritis.* As a *stimulating lotion* to *unhealthy granulations*, and to check bleeding from hemorrhoids, weak solutions of nitric acid are used.

What are the preparations of the mineral acids, and what are their doses?

1. ACIDUM SULPHURICUM (*sulphuric acid—oil of vitriol*) contains 96 per cent. of *absolute* sulphuric acid, and is too strong for internal use.

ACIDUM SULPHURICUM DILUTUM (*diluted sulphuric acid*) contains 10 per cent. of the *officinal sulphuric acid*, and is used internally as a *tonic, refrigerant, astringent* and *hæmostatic;* dose ♏ij–xx, freely diluted.

ACIDUM SULPHURICUM AROMATICUM (*aromatic sulphuric acid—elixir of vitriol*) contains 20 per cent. of the *officinal acid* with alcohol, tincture of ginger and oil of cinnamon. It is used as a pleasant substitute for the preceding preparation and is given in the same doses.

2. ACIDUM NITRICUM (*nitric acid*) contains nearly 70 per cent. of *anhydrous* acid, and is not employed internally.

Acidum Nitricum Dilutum (*diluted nitric acid*) contains 10 per cent. of *absolute* nitric acid; dose ♏ij–xx, freely diluted.

3. Acidum Hydrochloricum (*hydrochloric acid—muriatic acid*) contains nearly 32 per cent. of *absolute* acid, and is not used internally.

Acidum Hydrochloricum Dilutum (*diluted hydrochloric acid—diluted muriatic acid*) contains 10 per cent. of the absolute acid. It is (probably) a normal constituent of the gastric juice, and is used as an aid to digestion; dose ♏v–xx, freely diluted.

4. Acidum Nitro-hydrochloricum (*nitro-hydrochloric acid—nitro-muriatic acid—aqua regia*) is used as a stomachic tonic and to increase the secretions of the liver and intestines; dose ♏ij–x, freely diluted.

Acidum Nitro-hydrochloricum Dilutum (*diluted nitro-hydrochloric acid—diluted nitro-muriatic acid*); dose ♏ij–xx, freely diluted.

5. Acidum Phosphoricum (*phosphoric acid*) contains 50 per cent. of ortho-phosphoric acid, and is not used internally.

Acidum Phosphoricum Dilutum (*diluted phosphoric acid*) contains 10 per cent. of ortho-phosphoric acid, and is chiefly used as an aid to digestion; dose ♏v–xxx, freely diluted.

What medicines are incompatible with the mineral acids?

1. Alkalies and their carbonates and the salts of lime and lead are incompatible with the mineral acids, which also decompose salts of the vegetable acids, uniting with their bases.

2. The mercurial salts should not be given during the administration of hydrochloric or nitro-hydrochloric acids or their preparations, as they may react with the mercury and form corrosive sublimate.

How and when are these acids administered?

They are administered before or after meals, according to the indications present, and may be given freely diluted with water either alone or with glycerin and syrup, or with some of the bitters.

They should be taken through a glass tube to prevent injury to the teeth, or the mouth may be washed out immediately after their use with some weak alkaline solution.

ACIDUM LACTICUM—LACTIC ACID.

What is lactic acid?

Lactic acid is a syrupy liquid, formed by the souring of milk.

What are its effects and uses?

It is a normal ingredient of the gastric juice. In *medicinal doses* it increases the appetite, aids digestion and stimulates nutrition. In *large doses* (f℥j) or *long continued* it disorders digestion, causing flatulency and epigastric pain. *Injected into the peritoneal cavity* (dog's) it produces endocarditis, and when given for a very long time (in diabetes) it has caused acute rheumatism. *Lactic acid is used* to *diminish the acidity* of the gastric juice, or to *replace the deficiency of the acid;* to aid digestion and nutrition in *oxalic*, *phosphatic* or *uric* acid *diathesis;* in *diabetes*, and *locally* as a solvent for the false membranes of croup and diphtheria.

What are its preparations and doses?

Acidum Lacticum (*lactic acid*) contains 75 per cent. of absolute lactic acid. Dose ♏v–xxx, freely diluted and often prescribed in a mixture with pepsin.

ORDER III.—ALTERATIVES.

What are alteratives?

Alteratives are medicines which, without exerting any very perceptible action on any particular organ, so modify the nutritive processes as to enable nature to restore healthy action in many diseased conditions.

Mention the principal alteratives.

The preparations of mercury and of gold; iodine and the iodides; the arsenical preparations; cod-liver oil; the phosphates and hypophosphites; the chlorides of ammonium and calcium; colchicum; sarsaparilla; guaiac; and perhaps mezereon; menispermum: calendula; sassafras, stillingia and dulcamara.

HYDRARGYRUM—MERCURY.

What is mercury?

Mercury is a liquid metal principally obtained from the native sulphide or cinnabar.

What are the physiological effects of mercury?

Metallic mercury (quicksilver) is inert either when swallowed or applied to the skin, but if retained in the alimentary canal or after prolonged contact with the skin, it often becomes converted into an oxide and produces constitutional effects. *When inhaled* in a state of vapor it frequently causes salivation, ulceration of the mouth, necrosis and wasting; or in other cases loss of memory, vertigo, shaking palsy and other nervous symptoms.

Minute doses of mercurials, not too frequently repeated, increase the number of red corpuscles in the blood and improve nutrition. In *small and repeated doses* they stimulate the secretions of the skin and mucous membranes, the liver and kidneys and the salivary glands and pancreas, and promote absorption. *Corrosive sublimate* is an hepatic stimulant of considerable power, but the other preparations probably increase the flow of bile by irritating the duodenal mucous membrane, thus causing reflex contractions of the gall bladder. By stimulating the liver, *corrosive sublimate* increases the formation of urea, and thus proves diuretic. It also feebly stimulates the intestinal glands. *In moderate doses* the mercurials are cathartic (especially calomel and blue mass). *In large doses*, or continued for some time, the secretions are much increased and become pathological; the gums are swollen and tender, the mouth sore, the teeth feel elongated, salivation occurs, which becomes profuse if the medicine is continued; the breath is offensive, a metallic taste is experienced; the proportion of albumen, fibrin and red corpuscles to the fluid of the blood is diminished; the body wastes, and, if the abuse of mercury be continued, mercurial fever, diarrhœa, ulceration and sloughing of the gums, loosening of the

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nervous symptoms occur. Salivation (p

caused by blue mass and calomel, less so b

mercury with chalk.

Corrosive sublimate, beside its cholagogu retards hyperplasia of connective tissue, is a powerful gastro-intestinal irritant, and locally the best antiseptic, proving rapidly destructive to germs.

What are the symptoms and treatment of poisoning by corrosive sublimate?

The symptoms are violent gastro-enteritis with vomiting and purging, bloody stools, abdominal pain and tenderness, albuminous urine and death from collapse. The treatment consists in (1)giving an antidote, *albumen* is the best (*white of eggs*, milk or wheat flour); (2) giving an emetic; and (3) the free use of opiates and demulcents.

What are the therapeutic uses of mercury?

Mercury is used (1) as an *antisyphilitic*, either by the mouth (green iodide, calomel, blue mass, corrosive sublimate), fumigation (calomel), inunction (mercurial ointment or oleate), or hypodermic injection (albuminate, peptonate, or even calomel or corrosive sublimate). It is of most use in secondary syphilis, the iodides (alone or combined with the red iodide or corrosive chloride) giving better results in tertiary syphilis.

(2) As an *antiplastic and sorbefacient* in *acute glandular affections*, *iritis* and the *latter stages of inflammations* after plastic effusion has occurred. In *diphtheria* and *membranous croup* calomel is advantageously given in repeated doses guarded by minute doses of opium. In the latter disease the subsulphate is often used as an emetic. Mercurials are useful in ileo-colitis of infants (gray powder) and in acute dysentery (corrosive sublimate). (3) As an *indirect tonic* and to *stimulate secretions*, calomel, gray powder or blue mass are used in dyspepsia attended with constipation and torpid liver, and in the early stages of acute diseases. (4) As a *purgative* calomel and blue mass are often used, frequently followed by some saline. (5) *Locally* as *antiseptics* mercuric chloride or iodide are almost indispensable in surgical practice. Various preparations are used locally in various *skin diseases*, especially of parasitic origin, to *promote absorption* in *goitre, enlarged spleen, chronic epididymitis* and *orchitis* and other glandular swellings. The ointments are also used in conjunctivitis.

What are the preparations of mercury and their doses?

MASSA HYDRARGYRI (*mass of mercury—blue mass*), dose as a *laxative*, gr. v–xv ; as an *alterative*, *antisyphilitic*, or *sorbefacient*, gr. ss–iij, t. d., guarded by opium, and often combined in the treatment of syphilis with iron or quinine.

UNGUENTUM HYDRARGYRI (*mercurial ointment—blue ointment*). Not used internally. Used externally for *inunction* in syphilis ; as a *sorbefacient*; to *destroy pediculi;* and as a dressing to *syphilitic ulcers.*

EMPLASTRUM HYDRARGYRI (*mercurial plaster*), used locally as a *sorbefacient.*

EMPLASTRUM AMMONIACI CUM HYDRARGYRÔ (*plaster of ammoniac with mercury*), is more stimulating than the former.

HYDRARGYRUM CUM CRETÂ (*mercury with chalk—gray powder*), contains mercury, 38 parts, with prepared chalk and sugar of milk, and is used as an *alterative* and *antisyphilitic ;* dose for an adult gr. j–v, for a child gr. $\frac{1}{4}$ t. d ; as a mild laxative gr. v–xv (for a child gr. iij–v). It should not be prescribed in pill form.

HYDRARGYRI OXIDUM RUBRUM (*red mercuric oxide*) and

HYDRARGYRI OXIDUM FLAVUM (*yellow mercuric oxide*) are rarely used except in the form of

UNGUENTUM HYDRARGYRI OXIDI RUBRI (*ointment of red mercuric oxide—red precipitate ointment*) and

UNGUENTUM HYDRARGYRI OXIDI FLAVI (*ointment of yellow mercuric oxide*), each containing 10 per cent. of mercuric oxide, and which are applied in *granular* and other forms of *conjunctivitis* and in *corneal ulcers.*

OLEATUM HYDRARGYRI (*mercurial oleate*), contains 10 per cent. of the yellow oxide dissolved in oleic acid. Used chiefly for inunction in syphilis.

HYDRARGYRI CHLORIDUM MITE (*mercurous chloride—calomel*), dose, as a *purgative* or *anthelmintic*, gr. ss–j–x at bedtime ; as an *antisyphilitic* gr. $\frac{1}{10}$–j, t. d., with opium ; as an *alterative* and *absorbent* gr. ss–j every 2 or 3 hours ; for its effect on *secretions* gr. ss–j t. d.; to *arrest vomiting* gr. $\frac{1}{10}$–j, combined with sodium bicarbonate and frequently repeated. It is used externally as a dusting powder to the conjunctiva, and as an ointment in various skin affections. It is also used by *fumigation* in syphilis.

HYDRARGYRI CHLORIDUM CORROSIVUM (*mercuric chloride—corrosive sublimate*), used as an *alterative* and *antisyphilitic*, dose gr. $\frac{1}{16}$–$\frac{1}{8}$, by the mouth gr. $\frac{1}{48}$–$\frac{1}{16}$ by hypodermic injection. Locally, in weak solutions as an injection in *gonorrhœa* after the more acute stage has passed (gr. $\frac{1}{12}$–$\frac{1}{8}$–f℥viij) or as a *tæniacide* in ringworm, etc., or for the destruction of pediculi. As an *antiseptic* gr. viijss to hot water Oij = 1 part to 2000.

Hydrargyri Iodidum Viride (*mercurous iodide*), dose as an *antisyphilitic* gr. $\frac{1}{8}$–j combined with opium in pill. Used also locally, in the form of ointment, to syphilitic ulcers.

Hydrargyri Iodidum Rubrum (*mercuric iodide*), dose as an *alterative* or *antisyphilitic* gr. $\frac{1}{16}$–$\frac{1}{4}$. It is often combined with potassium iodide in the treatment of tertiary syphilis, and is used locally in the form of ointment to promote the absorption of glandular swellings, goitre, enlarged spleen, etc. As an *antiseptic* it is used in solution of gr. iv–vijss to hot water Oij. Potassium iodide increases its solubility.

Hydrargyri Cyanidum (*mercuric cyanide*) is used in syphilis as a substitute for corrosive sublimate, dose gr. $\frac{1}{16}$–$\frac{1}{12}$.

Hydrargyrum Ammoniatum (*ammoniated mercury—white precipitate*) is only used externally as

Unguentum Hydrargyri Ammoniati (*ointment of ammoniated mercury*), which contains 10 per cent. of ammoniated mercury, and is used especially in parasitic skin diseases and to destroy pediculi.

Hydrargyri Subsulphas Flavus (*yellow mercurial subsulphate—turpeth mineral*), dose as an alterative gr. $\frac{1}{4}$–ss; as an *emetic* in croup, gr. j–v, in syrup, repeated every 10 or 15 minutes until free vomiting occurs.

Hydrargyri Sulphidum Rubrum (*red mercuric sulphide—cinnabar—vermilion*). Not much used except for *fumigation*.

Unguentum Hydrargyri Nitratis (*ointment of mercurial nitrate—citrine ointment*), used externally (usually diluted with other ointment) in various skin affections, especially those of parasitic origin, to destroy pediculi and as a dressing for venereal ulcers.

Liquor Hydrargyri Nitratis (*solution of mercuric nitrate—acid nitrate of mercury*), used as an *escharotic*. Diluted with water, it forms a useful stimulating application to indolent ulcers.

What substances are incompatible with the mercurial preparations?

The *metallic preparations* and *calomel* are incompatible with the chlorides, hydrochloric and nitro-hydrochloric acids, which are apt to form with them corrosive sublimate. *Calomel* is also incompatible with the alkalies, their carbonates, alkaline earths, soap and the hydrosulphates. *Corrosive sublimate* is decomposed by nearly everything, and *green mercurous iodide* is converted into the more active red mercuric iodide by combination with iodine and other iodides.

AURUM—GOLD.

What are the physiological effects of the salts of gold?

Locally they are caustic. *Internally* in *small doses* they increase the appetite, digestion, glandular secretions, and excretions of urine and perspiration; they stimulate the nervous system, and particularly the spinal cord; they stimulate the sexual organs, and in women (probably) increase the menstrual flow. In *larger doses*, or after prolonged use, they disorder digestion, cause salivation without ulceration of the gums, diminish the oxygen-carrying function of the red globules, and stimulate the lymphatic system, thus causing rapid wasting. In *overdoses* they are gastro-intestinal irritants, the *symptoms* and *antidote* being the same as those of poisoning by corrosive sublimate.

What are the medicinal uses of the gold salts?

They are used as substitutes for corrosive sublimate in the treatment of *tertiary syphilis;* as *alteratives* in scrofula, chronic Bright's disease, myelitis, chronic ovarian inflammations and neuralgia; and as *aphrodisiacs* in functional impotence.

What are the preparations and doses of the gold salts?

AURI ET SODII CHLORIDUM (*gold and sodium chloride*) is the only officinal preparation; dose, gr. $\frac{1}{30}$–$\frac{1}{10}$, in pill or capsule.

IODUM—IODINE.

What is iodine?

Iodine is a non-metallic element, obtained from the ashes of seaweed.

What are the physiological effects of iodine and the iodides?

Iodine is a *disinfectant* and *antiseptic.* *Locally* applied, it is an *irritant caustic* to the skin and mucous membranes, staining the former yellow and causing superficial inflammation and desquamation, and sometimes even vesication. The *vapor*, when inhaled, is irritant to the air passages. In sufficient amounts it is a gastro-intestinal irritant. It enters the blood readily, and, combining with sodium or potassium, corresponds, in its constitutional effects, to the *iodides*. They *stimulate* the *lymphatic system* and cause the *absorption* especially of newly-formed tissues and diseased cells, thus removing indolent swellings, inflammatory and syphilitic deposits and various metallic poisons, as lead, mercury, etc., which may have been deposited in the tissues. When *too long administered*, they cause great emaciation and depression of the vital powers. They are rapidly *eliminated* by the mucous membranes (irritating them in their passage), salivary glands and kidneys.

Given in *large quantities*, they cause *iodism*, *i. e.*, malaise, some fever, frontal headache, coryza, lachrymation, sore throat, difficult swallowing, various eruptions on the face and shoulders and antaphrodisiac effects, sometimes permanent. The susceptibility varies greatly in different persons, but these symptoms may in great measure be prevented by copious draughts of water frequently taken during the course of treatment.

What is the treatment of acute poisoning by free iodine?

A decoction of starch is the *antidote*, followed by emetics, and opium and demulcents.

What are the therapeutic uses of iodine and the iodides?

They are employed as *alteratives* and *absorbents* in the active manifestations of *tertiary syphilis* (iodides chiefly), in the treatment of *scrofulous and glandular enlargements*, in the early stages of *cirrhosis* of the liver or kidneys, in the various forms of *sclerosis* of the nervous centres, and in *chronic poisoning* by mercury, lead and other metals; to aid the absorption of *lingering pneumonic consolidation* (ammonium iodide) and of *plastic* and *serous* inflammatory *exudations* (potassium iodide), in *aneurisms* (large doses of potassium iodide), in *chronic rheumatism* and in *malaria* (iodine preparations).

For their effects on the *mucous secretions* the iodides are given in *chronic bronchitis*, *spasmodic asthma*, *catarrhal pneumonia*, *acute catarrh*, *hay fever* and *duodenal catarrh*. It is highly recommended internally in the treatment of *typhoid fever*, and has been used to check the *vomiting of pregnancy*. *Locally*, *iodine* is used by inhalation in *catarrh*, *coryza* and *hay fever*, and is applied to *aid absorption* and as a *counter-irritant* to *chronic inflammations* and *chronic glandular* and other *swellings*. *The tincture* is *injected* undiluted into the serous cavity after the removal of the fluid in empyema, hydrocele, etc., and is applied to the uterine cavity in various forms of *endometritis*.

What are the preparations and doses of iodine and the iodides?

LIQUOR IODI COMPOSITUS (*compound solution of iodine—Lugol's solution*), containing iodine (5 parts), potassium iodide (10 parts), and water (85 parts); dose ♏v–xv t. d.

TINCTURA IODI (*tincture of iodine*), containing 8 per cent. of iodine; dose ♏ij–xv t. d. It is chiefly used externally.

UNGUENTUM IODI (*iodine ointment*) contains iodine (4 parts), potassium iodide (1 part), water (2 parts) and benzoinated lard (93 parts).

POTASSII IODIDUM (*potassium iodide*), dose gr. ij–xv–ʒj t. d.

UNGUENTUM POTASSII IODIDI (*ointment of potassium iodide*) is much less powerful than iodine ointment.

AMMONII IODIDUM (*ammonium iodide*), dose gr. ij–xv.

SODII IODIDUM (*sodium iodide*), dose gr. v–xxx.

SULPHURIS IODIDUM (*sulphur iodide*) is but little used. Dose gr. ½–j.

AMYLUM IODIDUM (*iodized starch*) is used as a dressing for syphilitic ulcers.

The *mercurial iodides* and *iron iodide* have already been mentioned. *Arsenic, zinc and lead* iodides will be described in their appropriate places.

What are the incompatibilities of these preparations?

The *iodides* are incompatible with the acids and acidulous salts, with the soluble metallic salts generally; with most of the alkaloids and with sweet spirits of nitre. Iodine is precipitated from the *tincture* on the addition of water.

How are iodine and the iodides administered?

Lugol's solution may be given in syrup and water. The iodides may be administered in compressed pill or capsule, or they may be given dissolved in water flavored with orange syrup, or in one of the bitter tinctures, or in compound syrup of sarsaparilla. Nothing effectually disguises their unpleasant taste.

ARSENIUM—ARSENIC.

What is arsenic?

Arsenic is a metallic element, found in various ores combined with other metals as an arsenide.

Mention some of the tests for arsenic.

When *in powder*, if heated with charcoal in a small test tube, it sublimes and condenses in the form of a brilliant steel gray ring of minute octahedral crystals, soluble in sodium or calcium hypochlorite. When in *solution*, the addition of sulphuretted hydrogen or ammonium sulphide produces a lemon-yellow arsenic trisulphide, insoluble in diluted hydrochloric acid, but soluble in a solution of ammonium carbonate: also the addition of ammonia water followed by a solution of silver nitrate, gives a canary-yellow silver arsenite. Marsh's and Reinsch's tests should also be used.

What are the physiological effects of arsenical preparations?

Metallic arsenic is inert, but when swallowed may be converted into arsenious acid and cause poisoning. No matter how administered, it has a selective action on the gastro-intestinal and broncho-pulmonary mucous membranes. *Locally*, arsenious acid is a painful *caustic*, and when in sufficient amount produces so much inflammation that absorption cannot take place. The *inhalation* of arsenical fumes (as from wall papers) have caused poisoning. Given *internally in small doses* it improves the appetite, digestion, nutrition and condition of the blood; stimulates the secretions of the alimentary canal and increases peristalsis; slightly stimulates the respiratory and circulatory centres and the cerebral functions; and lessens the excretion of carbonic acid and urea. *In larger doses* (not toxic), or when *taken for some time continuously*, it irritates the mucous membranes, disorders digestion, gives rise to *epigastric pain*, *nausea* and vomiting, diarrhœa, tenesmus and sometimes dysentery, palpitation, oppressed breathing, *œdema of the eyelids*, albuminuria, cutaneous eruptions, tremor and disordered sensation. It is *eliminated* by the mucous membrane, liver, kidneys and skin. *Tolerance* is sometimes established, and very large doses may be taken without poisonous effect.

What are the symptoms, pathological anatomy and treatment of acute arsenical poisoning?

The symptoms of the gastro-intestinal variety of poisoning are *intense* burning pain in the epigastrium, radiating over the abdomen, violent vomiting, great thirst, bloody and offensive stools, strangury and bloody urine, rapid feeble heart, oppressed breathing and collapse, sometimes simulating cholera. *Those of the cerebral variety* are sudden, profound insensibility and coma with collapse.

Pathological Anatomy.—Alimentary mucous membrane congested, eroded, softened and ecchymotic; *broncho-pulmonary mucous membrane* and lungs congested; fatty degeneration of the *liver*, *kidneys* and other organs. *Treatment* (1), give a *prompt emetic* or use the stomach pump; (2) give as antidotes *hydrated oxide of iron* or the *hydrated oxide with magnesia*, and continue the emetics; (3) mucilaginous drinks to protect the surfaces; (4) large amounts of diluents to favor elimination.

Prognosis.—Death often results long afterward, from the pathological conditions.

What are the medicinal uses of the arsenical preparations?

Arsenic is used as a *tonic* and *alterative* in *anœmia* and *chlorosis*, persistent *malaria*, *rheumatoid arthritis* and *chronic rheumatism*, and to delay the formation of connective tissue in the various *scleroses* and the growth of *carcinomata.* In minute doses it is used as a gastric tonic in *irritative dyspepsia*, *gastric ulcer* and *cancer*, and in *gastralgia* and *enteralgia.* (Fowler's Solution.) In *emphysema*, *chronic bronchitis* and *phthisis* it is of value. For its nervous action it is used in *chorea*, *neuralgiæ*, *paralysis agitans* and *melancholia.* In *chronic skin diseases*, as psoriasis, eczema and acne, it is of the greatest service, and in *diabetes* and *sexual debility* it is highly recommended. *Locally*, arsenious acid has been used as a caustic in *lupus*, *onychia maligna*, *cancer*, and to destroy the nerves of carious teeth. Cigarettes made of bibulous paper saturated with a solution of sodium arseniate are smoked for the relief of *asthma.*

Rx Sol ther. [illegible] gr 150 [illegible]
magnesia in [illegible] 3/150 [illegible]
aqual [illegible] f 32 [illegible]
dose - ~~table~~ spoonful every [illegible]
15 minutes

What are the preparations and doses of arsenic?

Acidum Arseniosum (*arsenious acid—white arsenic*), dose gr. $\frac{1}{16}$–$\frac{1}{12}$ in pills t. d.

Liquor Potassii Arsenitis (*solution of potassium arsenite—Fowler's Solution*) contains arsenious acid gr. $\frac{6}{10}$ in each f℥j of solution; dose ♏j–x, freely diluted. - 2 - X

Liquor Acidi Arseniosi (*solution of arsenious acid*), dose ♏j–x, freely diluted.

Sodii Arsenias (*sodium arseniate*) is milder in its action than the foregoing preparations; dose gr. $\frac{1}{12}$–$\frac{1}{4}$.

Liquor Sodii Arseniatis (*solution of sodium arseniate*), dose ♏ij–x, freely diluted. – 11 - X

Arsenii Iodidum (*arsenic iodide*), dose gr. $\frac{1}{8}$ t. d.

Liquor Arsenii et Hydrargyri Iodidi (*solution of arsenic and mercuric iodide—Donovan's Solution*) contains 1 per cent. of arsenic iodide and of mercuric iodide each, and is used in obstinate syphilis and in papular and squamous skin diseases; dose ♏ij–x, freely diluted.

What medicinal substances are incompatible with these preparations?

The *salts of iron*, *magnesium* and *calcium* and the *astringents* are chemically incompatible with the preparations of arsenic. *Fowler's Solution* should not be prescribed with infusions or decoctions of cinchona nor *Donovan's Solution* with the alkalies, or the salts of the alkaloids.

How and when is arsenic administered?

As individual susceptibility to arsenic varies greatly,* it is better to give a small dose at first. When it is determined that the patient can take arsenic, large doses should be given until some constitutional symptoms occur, when the medicine is discontinued for a few days. Or full doses of the liquid preparations gradually decreased to the minimum and as gradually increased may be given when it is desirable to continue the medicine for some time. Arsenic is less apt to disorder the stomach when freely diluted and taken after eating.

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* The author has seen gastro-enteric symptoms follow the administration of one dose of Fowler's Solution ♏j.

[illegible] Sulph [illegible]

OLEUM MORRHUÆ—COD-LIVER OIL.

What is cod-liver oil?

Cod-liver oil is a *fixed oil* obtained from the *liver* of Gadus morrhuæ, or codfish (*Class* Pisces; *Ord.* Teleostia; *Fam.* Gadida).

What are its principal chemical constituents?

It contains various fatty acids, several biliary principles, *gaduin*, *iodine*, *chlorine* and traces of *bromine*.

What are its physiological effects?

Cod-liver oil is more of a *food* than a *medicine*. It is readily absorbed, whether rubbed into the skin or taken internally. Oil is digested in the intestines (not in the stomach), and is readily assimilated. In suitable doses, it *improves* the *appetite* and *digestion* and *increases nutrition*. In large doses, or in very hot weather, it causes nausea and diarrhœa.

What are its therapeutic applications?

Cod-liver oil is used as a *nutrient* in chronic wasting diseases, particularly in *phthisis* (the earlier it is given, the more pronounced are its effects), also in *rickets*, *scrofula*, *chlorosis*, *rheumatoid arthritis*, *chronic rheumatism*, *chronic bronchitis*, *emphysema* and *chronic intestinal diseases* leading to mal-nutrition.

It is applied *locally for its constitutional effects* when it cannot be taken internally, and also in squamous skin affections.

What is the dose of cod-liver oil, and how should it be administered?

OLEUM MORRHUÆ (*cod-liver oil*) is given in doses of fʒj–f℥ss t. d., and preferable ½ to 2 hours after meals. The *pure oil* is the best form for administration. If it nauseates it may be given in emulsion with the hypophosphites, or with mucilage of acaciæ and oil of lemon. The addition of a few drops of ether renders it more easy of digestion.

THE PHOSPHATES AND HYPOPHOSPHITES.

What is the chemical difference between a phosphide, a phosphate and a phosphite?

A *phosphide* is formed by the direct union of *phosphorus*; a *phos-*

phate by the union of *phosphoric acid*, and a *phosphite* by the union of *phosphorous acid* with a base.*

What are the physiological actions of the phosphates and hypophosphites?

They increase the nutrition of the body.

Calcium phosphate exists normally in all the tissues of the body, and hence is an important nutrient. It is to this salt that bone owes its hardness.

What are the medicinal uses of these substances?

They are used as *alteratives* and *nutrients* in diseases of mal-nutrition, especially when these salts are wanting in the system, as in *rickets*, *mollities ossium*, *caries* and *necrosis*, *delayed union* of fractures, *superlactation*, *prolonged suppuration*, *anæmia*, *chronic diarrhœa* and *chronic phthisis*. The *hypophosphites* have been lauded in the treatment of phthisis, but probably act only as nutrients.

What are the preparations of these salts and their doses?

CALCII PHOSPHAS PRÆCIPITATUS (*precipitated calcium phosphate*), a very insoluble preparation, and apt to form intestinal concretions; dose gr. v–x. It may be given in milk.

SYRUPUS CALCII LACTOPHOSPHATIS (*syrup of calcium lactophosphate*). The addition of lactic acid rendering the calcium phosphate much more soluble; dose fʒj–iv t. d.

AMMONII PHOSPHAS (*ammonium phosphate*) has been used as an alterative in gout and chronic rheumatism, but is probably of little value; dose gr. x–xxx t. d.

CALCII HYPOPHOSPHIS (*calcium hypophosphite*); POTASSII HYPOPHOSPHIS (*potassium hypophosphite*); SODII HYPOPHOSPHIS

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* In other words, whenever a salt ends in *ide* it is formed by the union of an element with a base (thus, iron ox*ide*, iron and oxygen; iron phosph*ide*, iron and phosphorus; iron iod*ide*, iron and iodine; iron sulph*ide*, iron and sulphur); when a salt ends in *ate*, it shows the union of an *acid ending in ic* with a base (thus, iron phosph*ate*, iron and *phosphoric acid*; iron sulph*ate*, iron and *sulphuric acid*; iron nitr*ate*, iron and *nitric acid*); when a salt ends in *ite*, it is composed of an *acid ending* in *ous* and a base (thus, sodium sulph*ite*, sodium and *sulphurous acid*; amyl nitr*ite*, amyl and *nitrous acid*, etc.).

(*sodium hypophosphite*), may each be given in doses of gr. x–xxx t. d. Usually administered as

Syrupus Hypophosphitum (*syrup of hypophosphites*), dose fʒj–ij t. d.

Syrupus Hypophosphitum cum Ferro (*syrup of hypophosphites with iron*) contains 1 per cent. of ferrous lactate, dose fʒj–ij t. d.

The *ferric phosphates* and *hypophosphite* have been considered under iron ; *sodium phosphate* will be mentioned with the cathartics.

CALCII CHLORIDUM—CALCIUM CHLORIDE.

What are the effects, uses and doses of this salt?

Calcium chloride is a gastro-intestinal irritant, and is supposed to possess *alterative* powers in *strumous affections*, *glandular enlargements*, *uterine fibroid* and *ovarian tumors.* Dose gr. x–xx in milk or water.

AMMONII CHLORIDUM—AMMONIUM CHLORIDE.

What are the effects, uses and doses of ammonium chloride?

In addition to the general effects of the ammonium salts (*q. v.*) it is an *alterative* and *expectorant. Locally* it is an irritant. *Internally*, in *small doses*, it stimulates the mucous membranes, increasing their secretions and epithelial exfoliation. It stimulates the intestinal glands and, perhaps, the liver. It aids the excretion of waste products and increases all the solids in the urine except uric acid. It is said to increase the menstrual flow in women. In *large doses* it irritates the stomach and intestines and proves purgative.

It is used as an *expectorant* (*q. v.*) and as an *alterative* in *enlarged glands*, *plastic exudations* (given internally and used locally), in *uterine fibroids*, functional *amenorrhœa*, in *muscular* and *chronic rheumatism* and *myalgia*, and in the early stages of *cirrhosis of the liver.* In *albuminoid* or *waxy infiltration of the liver*, *kidneys and spleen* it is a very valuable agent. It is also used in *neuralgia* and *neuralgic headache. Externally* it is applied as a *refrigerant* (℥j to water Oss) in the early stages of inflammation and in the later stages as a sorbefacient. Dose gr. v–xxx every three or four hours, in compressed pills, capsules or in solution with fluid extract of liquorice, which somewhat disguises its unpleasant taste.

COLCHICUM.

What is colchicum?

Colchicum is the *corm* and *seed* of C. autumnale or meadow saffron (*Nat. Ord.* Melanthaceæ), a native of Europe.

What alkaloid does it contain?

It contains *colchicine*, which is converted by mineral acids into *colchicein.*

What are its physiological effects?

Locally applied it is *irritant. Internally*, *colchicum*, *or its alkaloid in small doses*, increase the secretions generally, particularly the urine, increasing greatly the amount of urea and uric acid eliminated; in *larger doses* it causes nausea and vomiting, frequent purging, and depresses the heart's action; in *excessive doses* it acts as an irritant poison, producing violent vomiting and purging, great depression, collapse and death by failure of respiration.

How should poisoning by colchicum be treated?

(1) Give emetics and cathartics; (2) tannic acid, as a partial antidote; (3) demulcents, to protect the surfaces, and (4) opium and stimulants, to counteract the resulting depression.

What are the therapeutical uses of colchicum?

Colchicum is used as an *alterative* and *diuretic* in *acute gout* (often combined with magnesia and magnesium sulphate (Scudamore's draught) or with potassium iodide or other alkali) and in *rheumatism.* As a *diuretic* it is employed in ascites and other varieties of dropsy. As a *cholagogue* it is given in congestions of the portal circulation.

What are the preparations and doses of colchicum?

EXTRACTUM COLCHICI RADICIS (*extract of colchicum root*), dose gr. j–ij, in pill.

EXTRACTUM COLCHICI RADICIS FLUIDUM (*fluid extract of colchicum root*), dose ♏ij–iv.

EXTRACTUM COLCHICI SEMINIS FLUIDUM (*fluid extract of colchicum seed*), dose ♏ij–vj.

TINCTURA COLCHICI (*tincture of colchicum*), made from the seed, dose f℥ ss–j.

VINUM COLCHICI RADICIS (*wine of colchicum root*), dose ♏v–xx; as a purgative fʒ ss.

VINUM COLCHICI SEMINIS (*wine of colchicum seed*), dose ♏v–xxx —the best preparation.

Colchicine (not officinal), dose for hypodermic use gr. $\frac{1}{50}$.

SARSAPARILLA.

What is sarsaparilla?

Sarsaparilla is the *root* of smilax officinalis and other species of smilax (*Nat. Ord.* Smilaceæ), prickly shrubs of Mexico, Central and South America.

What special chemical principle does it contain?

A glucoside, called *smilacin* or *parillin*, which resembles saponin.

What are its effects and uses?

It has a very slight diaphoretic action, and in large doses is emetic and purgative. It is popularly supposed to depurate the blood. It has been used as an alterative in tertiary syphilis and in chronic rheumatism and various cachectic conditions.

What are its preparations and doses?

EXTRACTUM SARSAPARILLÆ FLUIDUM (*fluid extract of sarsaparilla*), dose fʒ ss t. d.

EXTRACTUM SARSAPARILLÆ COMPOSITUM FLUIDUM (*compound fluid extract of sarsaparilla*), containing also sassafras, mezereon and glycyrrhiza, dose fʒ j.

DECOCTUM SARSAPARILLÆ COMPOSITUM (*compound decoction of sarsaparilla*), containing the above ingredients and guaiac wood, dose f℥ iij–vj t. d.

SYRUPUS SARSAPARILLÆ COMPOSITUS (*compound syrup of sarsaparilla*), containing guaiac wood, pale rose, senna, glycyrrhiza, sassafras, anise and gaultheria. It decomposes corrosive sublimate, converting it into calomel. Dose f℥ ss–j t. d.

GUAIACI LIGNUM—GUAIAC WOOD.

GUAIACI RESINA—GUAIAC.

What are these substances?

Guaiacum wood, or lignum vitæ, is the *heart wood* of G. officinale and G. sanctum (*Nat. Ord.* Zygophyllaceæ), evergreen

America.

Guaiac is the *resin* of the wood of G. officinale, and is composed of *guaiaconic*, *guaiac* and *guaiacresinic acids*, *guaiac beta-resin*, *guaiac yellow* and *guaiacin*.

What are the effects, uses, preparations and doses of these substances?

Guaiac wood and resin slightly increase the secretions of the skin and mucous membranes, and in large doses prove emetic and cathartic. They have been used as *alteratives* in syphilis and chronic rheumatism, and also as *emmenagogues* in amenorrhœa and congestive dysmenorrhœa. In *tonsillitis* the tincture (fʒss every 3 or 4 hours) is of value.

The preparations are, TINCTURA GUAIACI (*tincture of guaiac*) and TINCTURA GUAIACI AMMONIATA (*ammoniated tincture of guaiac*); dose of either, fʒss–ij, 3 or 4 times daily, in milk.

MEZEREUM—MEZEREON.

What is mezereon?

It is the *bark* of daphne mezereum and other species of daphne (*Nat. Ord.* Thymelaceæ), and contains daphnin (a bitter glucoside) and an acid resin. *Locally* it is irritant; *internally in medicinal doses* it increases the secretions, especially of the salivary glands, skin and kidneys; *in overdoses* it is an irritant poison and may cause death. It is *used* (generally with sarsaparilla) as an alterative in chronic rheumatism, tertiary syphilis and strumous affections, and as a *masticatory*, it has been chewed in paralysis of the muscles of the tongue and deglutition.

EXTRACTUM MEZEREI FLUIDUM (*fluid extract of mezereon*), dose ♏x.

EXTRACTUM MEZEREI (*extract of mezereon*), not used internally.

UNGUENTUM MEZEREI (*ointment of mezereon*), used as a stimulating application.

What is menispermum?

It is the *rhizome* and *rootlets* of M. canadense, yellow parilla or Canada moonseed (*Nat. Ord.* Menispermaceæ), and contains *berberine*. It is supposed to be *tonic*, *diuretic*, *diaphoretic* and *alterative*, and is *used* as a substitute for sarsaparilla. There are no officinal preparations; dose gr. v–xx, in infusion.

What is calendula?

Calendula is the *fresh flowering herb* of C. officinalis or marigold (*Nat. Ord.* Compositæ). It contains *calendulin*, and is supposed to be *diuretic*, *diaphoretic* and *alterative*. It is not much used.

TINCTURA CALENDULÆ (*tincture of calendula*); dose f℥ss–j. It may be used externally (diluted) as an application to wounds and contusions.

What is sassafras?

Sassafras is the *bark* of the *root* of S. officinale (*Nat. Ord.* Lauraceæ), and contains a *volatile oil*. It is supposed to be a mild *alterative* and *diaphoretic*, and is *used* in combination with sarsaparilla. The *oil* is used as a flavoring ingredient and as a perfume.

OLEUM SASSAFRAS (*oil of sassafras*), dose gtt. ij–x.

What is stillingia?

It is the *root* of S. sylvatica or Queen's Delight (*Nat. Ord.* Euphorbiaceæ) and contains a *volatile oil* and a *resin*. It increases all the secretions and excretions, slightly stimulates the cardiac action and is believed to be alterative. It has been used in *secondary* and in *tertiary syphilis*, *scrofula* and *chronic rheumatism*.

EXTRACTUM STILLINGIÆ FLUIDUM (*fluid extract of stillingia*), dose f℥ss.

What is dulcamara?

It is the *young branches* of solanum dulcamara, woody nightshade or bittersweet (*Nat. Ord.* Solanaceæ), and contains *solamine* and *dulcamarine*. It is feebly narcotic, diaphoretic and diuretic. In large doses it is a cardiac depressant. It sometimes causes nausea and vomiting. It is neither hypnotic nor anodyne. It is chiefly *used* as an alterative in chronic eczema, psoriasis, etc., and has been recommended in whooping-cough, bronchitis and asthma.

EXTRACTUM DULCAMARÆ FLUIDUM (*fluid extract of dulcamara*), dose f℥ss–j.

ORDER IV.—ANTIPYRETICS.

What are antipyretics, and how do they act?

Antipyretics are remedies which reduce temperature in fever, but in medicinal doses have little or no effect upon it in the normal condition. The temperature may be lowered (1) by *lessening the production of heat*, or (2) by *increasing the loss of heat.* Heat production may be diminished either (1) by *depressing nutrition* (*i. e.*, by retarding oxidation and cell-proliferation), or (2) by *depressing the circulation of the part* (as by local abstraction of blood, etc.), or of the system (cardiac sedatives); while the loss of heat may be increased (1) by *increased evaporation* from the surface (diaphoretics), (2) by *increasing heat radiation*, through dilatation of the cutaneous vessels (amyl nitrite, alcohol, etc.), or (3) by *direct withdrawal of heat* from the surface (cold applications, etc.). The antipyretic group of medicines act chiefly by their effects on nutrition.

Mention the principal antipyretics.

Antipyrine; acetanilid (antifebrin); quinine; salicin; salicylic acid and the salicylates; salol; acetphenetidin; resorcin; hydroquinone; pyrocatechin; chinoline; thalline and kairine.

ANTIPYRINE.

What is antipyrine?

Antipyrine (not officinal) is an alkaloidal substance usually synthetically prepared, but also obtained from the destructive distillation of coal tar, and belonging chemically to the phenyl group of carbon compounds.

What are the physiological effects of antipyrine?

Locally applied it is *antiseptic* and *antifermentative.* *Internally*, it exerts its influence principally on *febrile temperature* and the *nervous system.* In *fevers*, when an antipyretic dose (gr. xv–xxx) is taken, the temperature rapidly falls several degrees (due to interference with the oxygen-carrying function of the blood, thus diminishing heat production, and partly also to dilatation of the cutaneous vessels, thus regulating heat distribution and increasing heat radiation), and more or less profuse sweating occurs. After an interval of from 4 to 12 hours the fever returns, sometimes preceded by a chill (which is not as severe as that caused by many of the other antipyretics, as kairine) and sometimes (very rarely) by depression almost amounting to collapse. Given in the same doses to a *healthy man* it only causes tinnitus aurium, nausea and a slight fall of temperature (about $\frac{1}{10}$°); *large doses* (ʒj) cause vomiting and giddiness.

Antipyrine is quickly absorbed, and probably interferes with nutrition by combining with the hæmoglobin of the red corpuscles, forming methæmoglobin (the face becomes livid and the lips bluish when large doses are taken). It does not permanently impair their function nor alter their form. Medium doses stimulate the heart and raise the arterial pressure (partly from spasm of the internal vessels); very large doses (in animals) directly paralyze the heart and lower the blood pressure. It is a cerebral sedative and analgesic and dilates the pupils. It influences respiration very little, if at all. It is eliminated by the kidneys, and when the perspiration is slight, increases the urine. It sometimes produces a cutaneous rash and (very rarely in therapeutic doses) induces vomiting. It is said to be hæmostatic.

What are its therapeutic uses?

It is used as an *antipyretic* in all cases of *hyperpyrexia*, as in *typhoid fever*, in *sunstroke* with high temperature, in the *exanthemata*, *surgical fever*, *pneumonia* and *erysipelas*. In *acute rheumatism* it not only lowers temperature but relieves the pain. It is not an antiperiodic, but may be used to reduce the temperature in *malarial fevers*.

As an *analgesic* it is much employed in *neuralgiæ*, the "lightning pains" of *locomotor ataxia*, *muscular rheumatism*, *myalgia*, *dysmenorrhœa*, and to allay the pains of the first stage of *labor*.

What is the dose of antipyrine, and how may it be administered?

The dose as an *antipyretic* is gr. xv–xxx, repeated as circumstances require; as an analgesic, gr. x–xv, repeated in from 1 to 4 hours, if necessary. It is given in capsules or in solution. As it is non-irritating, it may be used hypodermically.

ACETANILID.

What is acetanilid?

Acetanilid or *antifebrin* (not officinal) is a neutral chemical product, obtained by the action of crystallizable acetic acid and heat on aniline.

What are its physiological actions?

Like antipyrine, *acetanilid* is markedly *antipyretic* and *analgesic*.

As an antipyretic *in fevers* it acts more slowly than antipyrine, influencing the temperature in the same manner and being attended with the same symptoms, and with more marked cyanosis. As the temperature declines, the pulse becomes slower and stronger, and the arterial tension is elevated. Gastric and intestinal disturbance and other unpleasant concomitants rarely result. Given to *healthy men* in ordinary doses it produces no apparent effect. In *decided doses* acetanilid lessens the conductivity of nerves, depresses the reflex centres, and acts as an hypnotic. Given to animals *in toxic doses*, beside cyanosis it causes general prostration, stupor, rapidly lowered temperature, with primary stimulation and afterward depression of the heart and respiration, coma, convulsion and death.

What are its uses?

It is used as an *antipyretic* in all cases of high temperature, as *typhoid* fever, *acute rheumatism*, *scarlatina*, *phthisis* and *pneumonia*. As an *anodyne* it is employed, also, in the same diseases in which antipyrine is indicated, and has been found useful in *epilepsy*, particularly in the lesser attacks (*petit mal*).

How may it be administered, and in what doses?

The dose of acetanilid is from gr. iv–viij. It is quite insoluble in water, and is better given in capsules or in powder.

QUININE.

Is quinine used as an antipyretic?

Quinine (*vid.* p. 43) was formerly much used for this purpose, but at the present time it has been largely superseded by other agents.

As an antipyretic it is given in doses of gr. x–xx repeated as required.

SALICIN, SALICYLIC ACID AND THE SALICYLATES.

What are these substances, and whence are they obtained?

Salicin is a neutral principle found in several species of salix (*q. v.*). *Salicylic acid* is a derivative of salicin, is found also as a salt (of methyl) in oil of gaultheria, and has been prepared synthetically by combining pure carbolic acid with dry carbonic acid by means of heat. The *salicylates* are the salts formed by the union of this acid with bases.

What are the physiological effects of these substances?

The effects of *salicin* have been mentioned (*vid.* p. 46). It is *antipyretic*, *tonic*, *antifermentative*, *antiseptic*, and to a slight extent *antiperiodic*. It does not depress the heart to the same extent as does salicylic acid, although resembling the latter in many respects.

Salicylic acid, when *locally* applied, is *antiseptic* and *antifermentative.* Administered *internally in full doses* it lowers the temperature in fevers, causes profuse, sometimes exhausting, sweats, and produces symptoms similar to those of *cinchonism*, such as tinnitus aurium, partial deafness, headache, etc. After very *large doses* these symptoms are all increased, and dyspnœa, with depression of the heart and nervous system and dilated pupils are observed. If *toxic dose* be given, delirium, involuntary evacuations, stupor and death from respiratory failure occur. In healthy subjects salicylic acid in full doses often causes nausea and vomiting, is a cardiac depressant, inhibits the movements of the leucocytes, quickens and deepens the respiratory movements (producing dyspnœa), is a diaphoretic, does not affect the normal temperature, and is eliminated chiefly by the urine, which, if large amounts have been taken, will be of a green color (due to an increase of indican). The urine frequently contains albumen.

The salicylates administered internally are less irritant to the stomach than is salicylic acid; in other respects their effects are identical.

What are the medicinal uses of these substances?

Salicin is not much employed. It has been used as an *antipyretic*, especially in rheumatism. *Salicylic acid* is given as an *antipyretic* in various fevers, particularly in *acute rheumatism* in robust subjects. It not only lowers the temperature, but moderates the pain, yet probably does not decrease the frequency of cardiac complications. It has also been used with success as an *anthelmintic.* *Externally* it is applied for the removal of corns and warts; to check sweating of the feet; in eczema; and as an *antiseptic* to wounds and ulcers.

The *salicylates* are used internally as *antipyretics* in *acute rheumatism* and as *antizymotics* to prevent *fermentation* of the food in the stomach.

What are the preparations and doses of these remedies?

SALICINUM (*salicin*), dose gr. x–ʒj. In acute *rheumatism*, gr. iij–xv may be given every few hours.

ACIDUM SALICYLICUM (*salicylic acid*), dose gr. x–ʒj. In *acute rheumatism*, gr. x may be administered every hour until six doses are taken. If more is necessary, decrease the frequency of the dose.

SODII SALICYLAS (*sodium salicylate*), (ʒj contains acid salicylic, gr. 48), dose gr. v–ʒj. It is more soluble and less apt to cause vomiting than the acid, and hence is preferred for internal use.

LITHII SALICYLAS (*lithium salicylate*) is used for the same purposes and in the same doses.

Physostigmine salicylate will be spoken of in connection with physostigma.

What other officinal preparation is used for the salicylate which it contains?

OLEUM GAULTHERIÆ (*oil of gaultheria*), a volatile oil distilled from gaultheria procumbens or wintergreen. It contains *methyl salicylate*, and as it acts similarly to salicylic acid upon the system, it is administered for the same purposes in doses of ♏x–xv in capsules, repeated as required.

What should be done if, during the use of these medicines, tinnitus aurium or other symptoms of intoxication should occur?

The dose should immediately be decreased or the medicine discontinued.

SALOL.

What is salol?

Salol (not officinal) is an ether-combination of salicylic acid (60 per cent.) and carbolic acid (40 per cent.).

What are its physiological effects?

Locally it is *antiseptic*. *Internally* it lowers febrile temperature and produces sweating. The circulation is practically uninfluenced; the respirations increase in frequency and become shallow, tinnitus aurium and other salicylic acid symptoms sometimes occur. It is [illegible]hat analgesic. In the intestine, the pancreatic juice converts it into salicylic and carbolic acids, which renders antiseptic the remainder of the alimentary canal. It seems to make the bile more watery. It is eliminated chiefly by the urine, which after its use resists decomposition and becomes darker in color.

What are its uses and doses?

As an *antipyretic* it is used in *acute rheumatism*, in *typhoid* and other *fevers;* in *phthisis* and in *pneumonia;* as an *intestinal antiseptic* in *duodenal catarrh*, *typhoid fever* and *cholera;* to *prevent decomposition of urine* in *cystitis* and *pyelitis*, and as an *analgesic* in *neuritis*, *neuralgia*, *nervous headache*, etc. It is also said to be useful in *diabetes.*

Locally it is used as an antiseptic to replace iodoform in surgical dressings; dose gr. v–ʒj, in pills, capsules, or in solution, in alcohol or oil. It is insoluble in water.

ACETPHENETIDIN.

What is the source, action, uses and doses of this substance?

Acetphenetidin (not officinal) is an acetyl derivative of amidophenol. It reduces febrile temperature, causing only slight diaphoresis. After large doses there is cyanosis from the formation of methæmoglobin, vomiting, incoördination, hurried breathing and a tendency to sleep. It apparently exerts little or no influence over the heart.

It has been used as an *antipyretic*, chiefly in phthisis, in doses of gr. iij–vij.

What other antipyretics are occasionally used?

Resorcin; hydroquinone; pyrocatechin; chinoline; thalline and kairine, none of which are officinal.

Describe their effects and uses.

Resorcin, hydroquinone and pyrocatechin are isomers, being respectively meta-, para- and ortho-oxyphen[illegible]

Locally they are antiseptic and antif[illegible] they reduce febrile temperature and cause [illegible] by a more or less well-marked chill an[illegible] Fullness of the head or headache, flus[illegible] accompany these effects; the pulse an[illegible] erated but soon depressed. Large doses given to animals cause tremor, epileptiform convulsions, weak and rapid pulse, and finally failure of respiration. They are eliminated by the urine.

Chinoline is antiseptic and antipyretic, acting very similarly to resorcin. It depresses the heart and respiration, and paralyzes the reflex centres.

Kairine is also antipyretic, often causing much depression and acting dangerously on the blood.

Thalline is a synthetically prepared alkaloid used in the form of sulphate or tartrate. It is antipyretic, but causes profuse diaphoresis with, sometimes, dangerous depression almost amounting to collapse.

These substances have been used in all cases of high temperature as antipyretics, but have been superseded by newer and less dangerous drugs.

Of *resorcin* the dose is gr. v–xxx in solution ; of *hydroquinone* and *pyrocatechin* gr. ij–x ; of *chinoline* gr. vii–xv in solution in oil ; of *kairine* gr. vii–xx ; and of *thalline* gr. ii–xv in pills or capsules.

Class II.—Medicines acting on the body by their effects on the various organs.

(A) ON THE NERVOUS SYSTEM.

ORDER I.—Hypnotics.

What are hypnotics?

Hypnotics are remedies which are administered to induce sleep. Most of them are *narcotics*, or remedies which by a stupefying effect on the nerve centres, diminish our relationship with external nature; and many of them are also *anodynes*, or remedies which by lessening the excitability of the nerves and nerve centres, tend to relieve pain.

How do hypnotics act?

As during sleep the functional activity of the brain is depressed, while the nutritive function is active, and as it is necessary for the nutrition of an organ that the blood should pass through the capillaries in a slow, steady and continuous stream, removing the waste products and giving up substances capable of replacing the tissue destroyed, while during functional activity the blood is in larger amount, hurried through the vessels (which are dilated) in a tumultuous manner, and does not remove the waste as fast as it accumulates in the tissues, therefore a medicine to cause sleep must *depress the cerebral functions* or *regulate the blood supply* to the brain by either contracting its vessels or by determining more blood to other portions of the body.

Name the principal hypnotics.

Opium and its alkaloids; chloral; the bromides; hyoscine; paraldehyd; hypnone; urethan; cannabis Indica; cannabis Americana; humulus, and lactucarium.

OPIUM.

What is opium?

Opium is the *concrete milky exudation* [illegible] of Papaver somniferum (*Nat. Ord.* Papave[illegible] but cultivated throughout the civilized w[illegible]

What are its principal chemical ingredients?

It contains the following *alkaloids:* Morphine, narcotine, codeine, narceine, paramorphine (thebaine), papaverine, pseudomorphine, laudamine, hydrocotarnine, cryptopine, porphyroxine, meconine and others.

These are in combination with meconic and thebolactic acids.

What are the chemical tests for the presence of opium?

With even very diluted *solutions of opium*, *ferric chloride or sulphate* produces a blood-red ferric meconate. With *morphine and its salts*, *ferric chloride or sulphate* gives rise to a deep blue color, while *concentrated nitric acid* strikes with them a rich orange-red, slowly fading to yellow.

What are the physiological actions of opium?

Opium is hypnotic, anodyne, antispasmodic and diaphoretic. It also depresses the circulation and respiration. A *moderate dose* at first slightly stimulates, then calms, and finally depresses the *cerebral* functions, consciousness finally being lost in sleep, which is often disturbed by dreams; the reflex centres are depressed, and if the dose be toxic, finally paralyzed, death occurring from paralysis of the respiratory centre. The pupil is contracted from stimulation of the 3d pair of nerves. It depresses the *cardiac* motor ganglia, the pulse becoming slower and fuller and the arterial tension elevated. *Respiration* is slowed. The *secretions* are all diminished, except that of the skin, which is increased. Peristalsis is retarded. *Elimination* takes place chiefly through the kidneys. Occasionally, intense itching of the skin, and sometimes cutaneous rashes occur. Headache, nausea and constipation commonly follow a medium dose of opium.

What are the symptoms and treatment of opium poisoning?

Giddiness, stupor, clammy skin, slow, full pulse, drowsiness and coma, with slow, stertorous breathing and minutely contracted (pinhole) pupils, abolition of the reflexes, and death from respiratory failure.

Death has resulted, in an adult, from morphine gr. ¼, hypodermically (rare), and from opium gr. ivss (rare). Children are very sus[illegible]tible to its action.

[illegible]*t.*—(1) Remove any poison present in the stomach by the stomach pump or emetics (zinc sulphate gr. xx–xxx, or cupric sulphate gr. v–x in a glass of tepid water, or apomorphine gr. $\frac{1}{16}$, hypodermically); (2) Catheterize the patient to prevent resorption of the opium from the urine; (3) Maintain respiration and circulation by hypodermics of atropine sulphate gr. $\frac{1}{60}$, repeated in half the amount at the end of 15 to 30 minutes if necessary, the guide to its administration being the respiration. Strychnine, caffeine or cocaine are also recommended. Faradization, cold effusions and artificial respiration are useful.

Post-mortem examination shows no characteristic changes in the organs.

How does the action of its alkaloids differ from that of opium?

The action of *morphine* differs from opium in that the former is less constipating, less of a diaphoretic, and about four times more powerful in other respects. *Codeine* is uncertain as an anodyne and hypnotic, but appears to possess a sedative effect on the vagus, thus quieting cough and bronchial irritation. The results of experiments with the other alkaloids are so conflicting that no reliance can be placed in them.

In what diseases is opium used medicinally?

As an *anodyne* opium or morphine is used in almost all diseases of which pain is a prominent and persistent symptom, and is only contraindicated when acute inflammation of the brain is present.

As a *hypnotic* in *delirium tremens* (often combined with the bromides or chloral) and in *sleeplessness* of fevers and other acute diseases; to *allay irritation*, especially when accompanied with *painful spasm*, as in the various forms of *colic* or in *asthma* (morphine hypodermically); in *severe acute vomiting* (by suppositories); to *check morbid discharges* or *restrain peristalsis*, as in *cholera*, *diarrhœa*, *dysentery*, and *enteritis*. In *peritonitis* for the latter effect and as an *anodyne*, large doses are required, a tolerance to opium being established.

In *puerperal septicæmia*, to *support the system* and as an *anodyne* it is of great value. As a *motor depressant* in *cerebro-spinal fever* very large doses are tolerated; also in *uræmic convulsions* (dangerous if the renal structure is much diseased), *puerperal eclampsia*, *tetanus*, *hydrophobia* and other affections with increased excitability of the reflex centres. In the *early stages of various inflammations*, for its influence on the circulation and tendency to retard effusion and relieve pain, and as a *diaphoretic* (Dover's powder) in muscular rheumatism, the early stages of acute catarrhs, etc., it is much employed. In *diabetes* opium and codeine are most reliable drugs to decrease the amount of sugar in the urine. *Great caution* should be exercised in prescribing opium in chronic diseases, as the *opium-habit* is almost certain to result. *Locally* opium is applied in solution as anodyne and sedative.

What are the preparations and doses of opium and its alkaloids?

Opii Pulvis (*powdered opium*) contains not less than 12, nor more than 16 per cent. of morphine. It is used in making the other preparations.

Opium Denarcotisatum (*denarcotized opium*) contains 14 per per cent. of morphine; dose gr. ss–ij.

Pilulæ Opii (*opium pills*), each pill contains of powdered opium gr. j.

Extractum Opii (*extract of opium*), dose gr. ss.

Emplastrum Opii (*opium plaster*) contains the extract with Burgundy pitch and lead plaster.

Trochisci Glycyrrhizæ et Opii (*troches of glycyrrhiza and opium — Wistar's cough lozenges*), each lozenge contains of extract of opium gr. $\frac{1}{20}$. Very useful in laryngeal or pharyngeal coughs.

Pulvis Ipecacuanhæ et Opii (*powder of ipecac and opium—Dover's powder*) is a diaphoretic and anodyne; dose gr. x, containing of opium and ipecac each gr. j with sugar of milk.

Tinctura Opii (*tincture of opium—laudanum*), dose ♏xij or 25 drops.

Tinctura Opii Deodorata (*deodorized tincture of opium*), dose ♏xij.

Tinctura Opii Camphorata (*camphorated tincture of opium—paregoric*) contains opium, diluted alcohol, oil of anise, benzoic acid, glycerine and camphor; dose fʒj–iv. To a young child gtt. iij–xx, according to age.

TINCTURA IPECACUANHÆ ET OPII (*tincture of ipecac and opium*). This is Dover's powder in a fluid form ; dose ♏xij–xx.

ACETUM OPII (*vinegar of opium—black drop*), dose ♏xij.

VINUM OPII (*wine of opium—Sydenham's laudanum*), dose ♏xij.

MORPHINÆ SULPHAS (*morphine sulphate*) ; MORPHINÆ HYDROCHLORAS (*morphine hydrochlorate*) ; MORPHINÆ ACETAS (*morphine acetate*). The salts are preferred to the pure alkaloid because they are more soluble. Dose of either gr. $\frac{1}{6}$–$\frac{1}{4}$ is equal to opium gr. j. They are well adapted to hypodermic use.

PULVIS MORPHINÆ COMPOSITUS (*compound powder of morphine—Tully's powder*) contains of morphine sulphate 1 part, with 20 parts each of camphor, liquorice and calcium carbonate ; dose gr. v–xv.

TROCHISCI MORPHINÆ ET IPECACUANHÆ (*troches of morphine and ipecac*). Each lozenge contains of morphine sulphate gr. $\frac{1}{40}$, and of ipecac gr. $\frac{1}{12}$.

Magendie's solution (not officinal), contains of morphine gr. xvj to the ounce. It has been used hypodermically, but should not be employed.

CODEINA (*codeine*), dose gr. $\frac{1}{4}$–ij.

What medicines are incompatible with opium ?

The alkalies precipitate morphine from solutions of opium and vegetable infusions containing tannic acid form a less soluble tannate of morphine ; many mineral salts are also decomposed by solutions of opium.

How is opium administered ?

Opium is often administered in the form of the officinal preparations, either alone or combined with other substances. The bromides, chloral or other hypnotics are often added to increase its soporific influence ; belladonna, etc., to enhance its anodyne effects ; lead or other astringent to act more powerfully in intestinal disorders ; potassium nitrate, or minute doses of antimony, to increase, while atropine is often combined with morphine to diminish, its action as a diaphoretic. It may be administered by the mouth or rectum (suppositories or laudanum enemata), and its alkaloids may also be given hypodermically.

CHLORAL.

What is chloral?

Anhydrous chloral is an oily liquid made by saturating absolute alcohol with dry chlorine gas, and is tri*chloral*dehyd. By uniting with water, a hydrate, the *officinal chloral*, is formed, which occurs as a crystalline solid.

What are its physiological effects?

Locally applied, chloral is antiseptic and irritant. Given *internally*, it is a hypnotic, motor depressant and cardiac sedative. In *medicinal doses*, it causes quiet, natural sleep, contraction of the pupil and deep, regular breathing. After *large doses*, the sleep is deeper and may even pass into coma, respiration is slowed, the cardiac action is weakened and diminished, the temperature falls, and sensibility and reflex action are depressed. It is not an anodyne. Nausea and vomiting sometimes occur from its irritant action on the mucous membrane, and in some persons excitement and even delirium may take the place of the sleep which it usually produces. The *continued use* of chloral causes *chloralism* or the *chloral habit*, and produces an anæmic condition, with weak, irregular heart, irritable temper and loss of self control: a state similar to delirium tremens has been observed.

What are the symptoms and treatment of chloral poisoning?

After toxic doses, profound narcosis, great muscular relaxation, slow and very weak pulse, diminished frequency of breathing, marked contraction of the pupil and lividity of surface, with great reduction of body heat, occur. Death is due to paralysis of respiration or to sudden failure of the heart from paralysis of its motor ganglia.

The smallest recorded fatal dose is gr. xxx.

The *treatment* for chloral poisoning consists in (1) maintaining the temperature by artificial heat; (2) maintaining the cardiac action by *atropine* in small doses, repeated as required, and (3) maintaining the respiration (partly by the atropine or by morphine, and partly by artificial manipulations). While chloral is the best antidote for strychnine poisoning, the converse does not hold good.

What are its therapeutical uses?

As a *hypnotic*, chloral is employed in *insomnia*, *hysterical* or *maniacal excitement*, and in *delirium tremens* and *mania-a-potu*, but is *contraindicated* in any condition where the heart is weak or has undergone fatty degeneration. As a *motor depressant* in *uræmic, infantile* or *puerperal convulsions*, in tetanus, and in poisoning by *strychnine*, it is of great service, and has been used in *whooping-cough* and *chorea.* It is also recommended in sea-sickness (gr. v t. d.) and to relax a rigid cervix during the first stage of labor. *Locally*, in diluted solution, it has been used as an *anodyne and antiseptic* dressing, and, triturated with equal parts of camphor, it forms a valuable liniment in neuralgic and muscular pains.

How is chloral administered?

The dose of chloral is gr. ij–xx, which may be repeated in an hour or two if sleep is not produced. It is better given in syrup. It should not be given with alkalies, which decompose it, chloroform and formic acid being formed.

What is croton-chloral hydrate?

Croton-chloral hydrate (not officinal), or butyl-chloral hydrate, is made by the action of chlorine gas on ethylic aldehyd, and occurs in small, glittering crystals. Its *effects* and *uses* are similar to those of chloral, and as it possesses a very decided anæsthetic influence over the filaments of the trigeminii, it is much used in the neuralgiæ affecting the branches of these nerves. Dose gr. v–xx, in glycerin or syrup.

THE BROMIDES.

What are the physiological effects of the bromides?

The *bromides* are hypnotic and depressors of the reflex spinal centres. Applied *locally* to the pharynx, they diminish its reflex irritability. Given *internally* they cause drowsiness and often sleep by inducing a condition of cerebral anæmia, depress the reflex spinal centres and the functions of the end-organs of peripheral nerves, thus lessening nervous irritability, reflex activity and cutaneous sensibility. They also depress the functions of the sympathetic nervous system. In very large doses *potassium bromide* lessens the cardiac frequency and force, lowers the arterial tension (while contracting the blood vessels), and finally in animals paralyzes the heart in diastole. This seems to be due to the potassium only (which is a cardiac and nerve poison), for the other bromides do not arrest the cardiac action. They slow the respiration and lower the temperature of the body. They are eliminated by the kidneys, skin and mucous membrane.

What is bromism?

When taken for a long time they induce a condition known as *bromism*, the symptoms of which are acne, anæmia, drowsiness, defective memory, malaise, impaired reflexes, malnutrition, loss of sexual power and desire, and often a tendency to melancholia. These symptoms pass away when the drug is discontinued. No case of *acute poisoning* is on record.

What are the medicinal uses of the bromides?

They are used as *hypnotics* in all forms of *insomnia due to cerebral hyperæmia*, but are contraindicated when anæmia is present. In the early stages of *delirium tremens* they are of great service. They are also given as *depressor motors* in local or general convulsions as *chorea*, *uræmic*, *puerperal*, *hysterical* or *infantile convulsions*, *tetanus*, and as an *antidote* to *strychnine poisoning* (inferior to chloral). In the treatment of *epilepsy* they rank among the best remedies. In reflex vomiting, as of sea-sickness or pregnancy, they are of use. In *whooping cough* ammonium bromide is often efficacious. In *migraine* they are sometimes beneficial. For their *influence over the sexual functions* they are used to control *nymphomania*, *priapism*, and *masturbation*. Conjoined with ergot they are used to decrease the uterine blood supply in *menorrhagia*, and are of utility in *subinvolution of the uterus*.

What are the officinal bromides?

POTASSII BROMIDUM (*potassium bromide*), dose gr. v–ʒj.

AMMONII BROMIDUM (*ammonium bromide*) has less influence on the circulation, respiration and temperature than the potassium salt; dose gr. v–xxx.

SODII BROMIDUM (*sodium bromide*), dose gr. v–ʒj.

CALCII BROMIDUM (*calcium bromide*), dose gr. v–ʒj.

ZINCI BROMIDUM (*zinc bromide*), dose gr. j–x (not much used).

Iron bromide (officinal as a syrup) has been spoken of under "Iron."

ACIDUM HYDROBROMICUM DILUTUM (*diluted hydrobromic acid*), containing 10 per cent. of the absolute acid, is said to possess similar effects to the bromides. It is chiefly used as a hypnotic, and added to quinine mixtures to prevent cinchonism; dose f℥ss–j.

What medicines are incompatible with the bromides?

Acids and the acidulous and metallic salts are chemically incompatible with the bromides. They are antagonized by cardiac and vaso-motor stimulants.

How may they be administered?

They may be given in powder or in solution in syrup. Zinc bromide may be used in pilular form. They are often given together in small doses, and to enhance their hypnotic effect may be combined with opium or its alkaloids, chloral or cannabis indica.

HYOSCINE.

What is hyoscine?

Hyoscine (not officinal) is one of the alkaloids found in hyoscyamus niger, or henbane (*q. v.*). It is an efficient hypnotic, and is usually employed in the form of hydrochlorate or hydrobromate; dose gr. $\frac{1}{80}$, or if used hypodermically, gr. $\frac{1}{120}$.

PARALDEHYD.

What is paraldehyd?

Paraldehyd (not officinal) is a colorless liquid with a disagreeable odor and taste, prepared by heating ethyl aldehyd with a mineral acid, or with zinc chloride.

What are its physiological actions?

In medicinal doses paraldehyd produces sleep closely simulating natural sleep, without affecting the cardiac action. It depresses the reflex centres, especially those of the upper part of the cord, and in *toxic amounts* depresses and finally paralyzes the respiratory centre, diminishing the amount of carbonic acid exhaled, and lowering the body temperature. It has no anodyne virtues. It often irritates the mucous membranes, and cutaneous eruptions sometimes follow its use.

What are its medicinal uses and dose?

It may be given as a *hypnotic*, where sleeplessness is not induced by pain, as in *delirium tremens*, *hysteria*, etc. As a *reflex depressor* it has been employed in *epilepsy*, and in animals poisoned by strychnine has proved antidotal. It is given in doses of f℥j, and should be freely diluted.

HYPNONE.

What are the actions and uses of hypnone?

Hypnone (not officinal), or acetophenone, is a liquid producing hypnotic but not anodyne effects, and in overdoses causing death from asphyxia. The indications for its *use* are similar to those for paraldehyd, but it is not much employed. It has been used hypodermically in insanity. Dose ♏v–xij.

URETHAN.

What are the effects and uses of urethan?

Urethan (not officinal) is ethyl carbamate, and occurs in crystalline masses. *In medicinal doses* it causes tranquil sleep, preceded by a short period of excitement. It depresses the reflex centres, at first quickens but soon slows the respiration and somewhat reduces the temperature, and in overdoses causes, in animals, death from respiratory paralysis. The effect upon the heart is disputed. It is not analgesic. It has been much *used* as a *hypnotic* in simple insomnia with varied success, and appears to be more applicable to cases where the action of chloral on the heart contraindicates the use of that agent. As a *motor depressant* it has been employed in *tetanus*, *infantile convulsions* and *puerperal eclampsia*. Dose gr. ij–xxx.

CANNABIS INDICA—INDIAN CANNABIS; CANNABIS AMERICANA—AMERICAN CANNABIS.

What are these drugs?

Cannabis Indica is the *flowering tops* of the female plant of C. sativa or hemp (*Nat. Ord.* Urticaceæ) grown in the East Indies; while *C. Americana* is the *whole plant* grown in the Southern United States, and collected while flowering.

What are the active chemical constituents of hemp?

The alcoholic extract contains a *resin* (cannabin) and a volatile oil. It is claimed that several alkaloids have been discovered, but their existence is, as yet, doubtful.

What are the physiological actions of cannabis?

In full *medicinal doses* it at first stimulates and then depresses the cerebro-spinal functions without affecting respiration or circulation to any marked extent. The mental exhilaration is usually of a pleasurable kind, the pupils are dilated, ideas flow rapidly and conception of time and space are so altered that seconds seem hours and objects a few feet off seem miles away; an active, busy delirium usually occurs and sometimes increase of the sexual appetite; this is followed by a sense of weight in the extremities, depression of the reflexes, some loss of muscular power and cutaneous anæsthesia, succeeded by sleep. It increases but does not originate uterine contractions. No fatal case from its use is recorded.

What are its therapeutic uses?

It is used as a *hypnotic* in *mania* and in *mania-a-potu;* as an *anodyne* in *neuralgia*, *migraine*, *dysmenorrhœa*, *rheumatism*, and *gout;* as an *antispasmodic* in *tetanus*, *chorea*, *hysteria* and *spasm* of the neck of the bladder. It is highly recommended in *dysentery*, and is of undoubted service in checking *uterine hemorrhages* not due to abortion or following labor.

What are its preparations and doses?

EXTRACTUM CANNABIS INDICÆ (*extract of cannabis Indica*), dose gr. ¼–j.

EXTRACTUM CANNABIS INDICÆ FLUIDUM (*fluid extract of cannabis Indica*), dose ♏j–x.

TINCTURA CANNABIS INDICÆ (*tincture of cannabis Indica*), dose ♏–xxx. In using a new sample of cannabis Indica always begin with the minimum dose, as different samples vary much in strength.

HUMULUS.

What are the effects, uses, preparations and doses of humulus?

Humulus are the *strobiles* of H. lupulus or hop-vine (*Nat. Ord.* Urticaceæ). *Lupulin* is a yellow powder found near the base of the strobiles. It contains a volatile oil, a bitter principle (*lupulite*), resin, etc.

Hops are tonic, very feebly narcotic, anaphrodisiac and diuretic. They are used as a *hypnotic* in mild forms of *delirium tremens*, and in *restlessness* and *sleeplessness* from overwork; as an *anaphrodisiac* in *priapism*, *chordee*, *nymphomania* and *satyriasis;* as a *diuretic* and *anodyne* in *irritation of the bladder*, and locally as an anodyne poultice, and as a sedative injection in acute vaginitis.

TINCTURA HUMULI (*tincture of humulus*), dose f℥j–iv or more.

LUPULINUM (*lupulin*), dose gr. v–x, but not much used in this form.

EXTRACTUM LUPULINI FLUIDUM (*fluid extract of lupulin*), dose f℥ss–ij.

OLEORESINA LUPULINI (*oleoresin of lupulin*), dose ♏x–xxx.

LACTUCARIUM.

What are the effects, uses and preparations of lactucarium?

Lactucarium is the *concrete milk-juice* of lactuca verosa, the garden lettuce (*Nat. Ord.* Compositæ), and contains *lactucin*, which is said to be even more feebly hypnotic than the crude drug. Lactucarium is supposed to possess *anodyne* and *hypnotic* powers, and has been used as a substitute for opium when the latter is indicated, but cannot, for any reason, be given. Its action, if any, is very mild

EXTRACTUM LACTUCARII FLUIDUM (*fluid extract of lactucarium*), dose f℥j.

SYRUPUS LACTUCARII (*syrup of lactucarium*), dose f℥ij–iv.

ORDER II.—MYDRIATIC ANODYNES.

What are the mydriatic anodynes?

The *mydriatic anodynes* are remedies employed as analgesics and antispasmodics, which possess no hypnotic effect, but cause dilatation of the pupil and, in large doses, a restless delirium.

What medicines are included under this head?

Belladonna, stramonium, hyoscyamus, duboisia, erythroxylon, and their alkaloids, and antipyrine.

BELLADONNA.

What is belladonna?

Belladonna is the *leaves* and *root* of Atropa Belladonna or deadly nightshade (*Nat. Ord.* Solanaceæ), a European plant, cultivated in this country.

What are the chemical constituents of belladonna?

Its properties depend upon an alkaloid called *atropine*, which exists in the plant as a malate.

What are the tests for atropine?

A delicate test is the addition of hydrobromic acid, which produces a yellow, amorphous precipitate, soon becoming crystalline. The *physiological test* (viz., the dilatation of the pupil in the lower animals after the local application of the suspected solution) should always be resorted to.

What are the physiological effects of belladonna and its alkaloid?

Applied *locally* to the skin, it is absorbed, lessens the sensibility of the sensory nerves, and produces constitutional effects. *Small doses, administered internally*, cause dryness of the mouth and throat, with some headache; after *larger amounts*, there is difficulty in swallowing, from arrest of the mucous and salivary secretions, the pupils dilate widely, the skin becomes dry and a scarlatinoid rash appears, the cardiac action is accelerated, and an active delirium occurs. In *moderate doses*, they act as *cerebral excitants; larger doses* produce hallucinations and impair the excitability of the motor and sensory nerves, thus producing a peculiar delirium in which there is a great desire for constant motion associated with lassitude. The *spinal reflex centres* are first stimulated, afterward paralyzed, if the amount taken be sufficiently large. It paralyzes the 3d nerves and stimulates the end organs of the sympathetic, thus dilating the *pupil* whether used locally or internally; the power of accommodation is also paralyzed, and after large doses the intraocular tension is lessened.

The *cardiac action* is at first slowed, if the dose be small (from stimulation of the inhibitory centre), but is soon much quickened (from progressive paralysis of the peripheral filaments of the vagus and stimulation of the cardio-accelerator centres or nerves). Large doses paralyze the cardiac muscle. Atropine stimulates the vasomotor centres and raises the arterial pressure, but after toxic doses the arterioles dilate, from paralysis of their muscular walls, and the blood pressure falls. It first stimulates and then paralyzes the respiratory centre. The *temperature* rises after moderate doses, probably from stimulation of the thermo-genetic spinal centres; but after toxic amounts have been taken a decided fall of temperature occurs, probably from vaso-motor paralysis. Small doses probably increase *intestinal peristalsis*, by depressing the inhibitory fibres of the splanchnics, while large doses paralyze the non-striated muscular fibres of the intestines and bladder. It arrests the *secretions* of the skin, mammary, salivary and muciparous glands, and probably of the liver and pancreas, by paralyzing the terminal filaments of the secretory nerves. The intestinal secretions are probably increased, as is that of the kidneys (usually). After large doses, the urine may be entirely suppressed.

Atropine is eliminated principally by the kidneys.

What are the symptoms and treatment of atropine poisoning?

The pupils dilate so widely that the iris can scarcely be seen; swallowing is impossible, from dryness of the throat and mouth; the muscular system is relaxed; maniacal delirium occurs, with impaired sensation, failing pulse, quickened followed by failing respiration, stupor, coma, sometimes convulsions, diminished body heat, and death usually from asphyxia. The *treatment* consists of: (1) *evacuation of the contents* of the *stomach* (by emetics or stomach pump), *bowels* (by cathartics) and *bladder* (by the catheter), to prevent further absorption of the poison; (2) *giving tannic acid* freely as a chemical antidote; (3) *giving pilocarpine*, *physostigmine* or *morphine* hypodermically, as partial physiological antagonists, and (4) maintaining the circulation and respiration by electricity and artificial respiration.

What are the medicinal uses of belladonna and atropine?

As an *anodyne* in the various *neuralgiæ*, either locally or given by the mouth, rectum or subcutaneously, it is of value, and is often combined with morphine. In *muscular rheumatism* and in *myalgia* it is also of service. In *conjunctivitis* and in *iritis* it is used locally, not only to dilate the pupil but to lessen pain.

As an *antispasmodic* it is used to relax spasm and allay pain in *lead colic*, *spasmodic dysmenorrhœa*, and *cramps* of the bowel, bladder and urethra; also to relax the *rigid cervix uteri* in labor. In *asthma*, in *laryngysmus stridulus* and *whooping cough* it often proves of use. In *habitual constipation*, a small amount combined with purgatives increases their action by relaxing spasm of the intestinal muscular layer and stimulating peristalsis. It is a valuable remedy in the treatment of *incontinence of urine in children* when given in doses sufficient to produce some constitutional effect.

As a *cardiac and vaso-motor stimulant* in all cases of threatened collapse from *heart failure* it is advantageously employed, and has been highly recommended to contract the blood-vessels in *acute inflammatory affections* generally. *To check excessive secretion*, as in *salivation*, *excessive sweating*, especially the *night-sweats of phthisis*, and in *colliquative diarrhœa*, it is of great value, and is a well-known *galactafuge*, being used internally and applied locally for this purpose. As a *respiratory stimulant* in *opium poisoning* atropine is of great service, and may be used in cases of poisoning by other substances attended with failure of respiration.

Locally, belladonna is used as an ointment, liniment or plaster for the relief of pain in *neuralgia*, *myalgia* and *muscular rheumatism;* to *allay cardiac palpitation;* to *relax spasmodic stricture* of the urethra (applied on a bougie or given by suppository), and as a *galactafuge*. In *ophthalmic practice* a solution of atropine (gr. $\frac{1}{20}$–iv to water f℥j) may be dropped into the conjunctival sac to *dilate the pupil* and to *paralyze accommodation*, so that an examination can be readily performed or the refraction of the eye determined. In various inflammations of the ocular apparatus, as conjunctivitis, keratitis, iritis, etc., it is used to lessen pain and diminish the blood-supply to the inflamed parts.

What are the preparations and doses of belladonna?

ABSTRACTUM BELLADONNÆ (*abstract of belladonna*), dose gr. ¼–ss.

EXTRACTUM BELLADONNÆ ALCOHOLICUM (alcoholic extract of belladonna), dose gr. ⅛–ss (in pill or suppository).

EXTRACTUM BELLADONNÆ FLUIDUM (fluid extract of belladonna), dose ♏j–ij.

TINCTURA BELLADONNÆ (*tincture of belladonna*), dose ♏v–xxx.

LINIMENTUM BELLADONNÆ (*liniment of belladonna*) contains 95 per cent. of the fluid extract.

UNGUENTUM BELLADONNÆ (*ointment of belladonna*) contains 10 per cent. of fluid extract.

Emplastrum Belladonnæ (*plaster of belladonna*).

Atropina (*atropine*), usually employed in the more soluble form of Atropinæ Sulphas (*atropine sulphate*), dose gr. $\frac{1}{120}$–$\frac{1}{60}$.

What substances are incompatible with belladonna?

Alkalies precipitate atropine from solutions of belladonna, and tannic acid forms with it atropine tannate, a less soluble salt.

What is homatropine hydrobromate?

It is the salt of an alkaloid derived artificially from atropine. *It differs from atropine* in dilating the pupil more rapidly and much more transiently, in not causing much constitutional disturbance when used locally for this purpose, and in slowing, not accelerating, the heart's action. *It is used* as a substitute for atropine in ocular therapeutics.

STRAMONIUM.

What are the source, composition, action and uses of stramonium?

Stramonium is the *leaves* and *seeds* of Datura Stramonium, thorn-apple, Jamestown weed or gypsum (*Nat. Ord.* Solanaceæ), a common indigenous plant. It *contains* an alkaloid called *daturine*, isomeric with atropine and having the same action. As this is the active principle of stramonium, the *effects* of the latter are identical with those of belladonna, and it may be *used* for the same purposes. The leaves have been made into cigarettes and smoked to avert a threatened paroxysm of *asthma*, and it has been used externally as a poultice or as ointment to *painful wounds*, *external inflammations*, *hemorrhoids* and *fissure of the anus*. The *officinal preparations* (all made from the seed) are :—

Extractum Stramonii (*extract of stramonium*), dose gr. ss.

Extractum Stramonii Fluidum (*fluid extract of stramonium*), dose ♏j–v.

Tinctura Stramonii (*tincture of stramonium*), dose ♏v–xv.

Unguentum Stramonii (*ointment of stramonium*) contains 10 per cent. of the extract.

HYOSCYAMUS.

What is hyoscyamus?

Hyoscyamus is the *leaves* of H. niger, or henbane (*Nat. Ord.* Solanaceæ), a native of Europe.

What does it contain?

It contains two alkaloids, *hyoscyamine* and *hyoscine*, both of which are isomers of atropine and daturine.

What are the physiological effects of hyoscyamus and its alkaloids?

Hyoscyamine appears to be identical in action to its isomer atropine, but feebler and less irritant. It does not dilate the pupil as rapidly, and, it is said, slows the respiration.

Hyoscine causes dryness of the mouth and throat, flushing of the face, sleep, slow respiration, and in large doses, slow, full pulse, muscular weakness, incoördination, diaphoresis, and, it is said, a rise in temperature. No fatal case of poisoning is recorded.

Hyoscyamus combines the action of its alkaloids, differing from that of belladonna in proving hypnotic.

What are the uses of hyoscyamus and its alkaloids?

Hyoscyamus has been used as a substitute for belladonna in the diseases in which the latter is employed. It has also been used as a *hypnotic* in various forms of *insanity*, in *delirium tremens*, and in *hysteria*. Added to *purgatives* it enhances their efficacy and prevents griping.

Hyoscyamine has been found useful in various forms of tremor, as that of *insular sclerosis* and *paralysis agitans*. It has sometimes proved useful in *chorea*. It has been highly recommended to quiet the violence of mania, but it is probable that the article used contained hyoscine.

Hyoscine is used as a *cerebral sedative* and *hypnotic* in maniacal excitement, and may be employed to produce sleep when morphine or chloral are contraindicated in advanced renal disease and in cases of weak heart. Disagreeable after effects are rare.

What are the preparations and doses of these substances?

ABSTRACTUM HYOSCYAMI (*abstract of hyoscyamus*), dose gr. ss–ij.

Extractum Hyoscyami Alcoholicum (*alcoholic extract of hyoscyamus*), a preparation of uncertain strength; dose gr. j–ij.

Extractum Hyoscyami Fluidum (*fluid extract of hyoscyamus*), dose ♏ v–x.

Tinctura Hyoscyami (*tincture of hyoscyamus*), dose f ʒss–j.

Hyoscyaminæ Sulphas (*hyoscyamine sulphate*), dose gr. $\frac{1}{100}$–$\frac{1}{50}$; less if used hypodermically.

Hyoscine Hydrochlorate (not officinal), dose gr. $\frac{1}{100}$–$\frac{1}{80}$; if given hypodermically, dose gr. $\frac{1}{150}$–$\frac{1}{100}$.

DUBOISIA.

What is duboisia?

Duboisia (not officinal) is the *leaves* of D. myoporoides (*Nat. Ord.* Solanaceæ), a shrub of Australia. It *contains* an alkaloid called *duboisine*, which is isomeric with atropine. *Locally* applied to the conjunctival sac, it paralyzes accommodation and dilates the pupil more rapidly but for a shorter time than does atropine and is less irritating. Given *internally* it dilates the pupil, stimulates the respitory centre and depresses the inhibitory cardiac ganglia, thus causing increase in frequency both of the respiration and cardiac action. It is *used* as a substitute for atropine in ophthalmic practice.

ERYTHROXYLON.

What is erythroxylon?

Erythroxylon is the *leaves* of E. Coca (*Nat. Ord.* Erythroxylaceæ), a shrub of Peru.

What does it contain?

It contains an alkaloid called *cocaine* combined with *cocatannic* acid.

What are the physiological effects of erythroxylon?

Erythroxylon is a cerebral stimulant, producing a sense of calm and well being, followed, if the dose is large, with a pleasant delirium. It lessens the sense of fatigue and of hunger, but does not take the place of food. Small doses appear to slow, while large quicken the pulse and cause an elevation of temperature. It diminishes the amount of urea excreted. Large doses cause, also, muscular weakness, drowsiness and finally deep sleep. When taken *in large doses habitually* it causes disordered digestion, enfeeblement of the intellectual powers, emaciation, ascites and death from marasmus.

Cocaine produces similar effects. It is a *cerebral* stimulant, causing delirium in large doses followed by epileptiform convulsions and coma if the dose has been excessive. It first stimulates, then depresses the *reflex spinal centres.* Toxic doses depress and finally paralyze the *nerves*, these effects being more marked on the nerves of sensation. The effect on the *circulation* is disputed, but in small doses it increases the strength and frequency of the cardiac contractions. It acts as a powerful stimulant upon the *respiratory* centre, but in large doses paralyzes it, the heart continuing to beat after the breathing has stopped. *Injected hypodermically* into the superficial tissues it causes local anæsthesia; if a deep injection is given a slight general lessening of sensibility, dilated pupils, a slight rise in temperature with strong cardiac contractions result.

Locally applied it causes marked anæsthesia of the surface with which it comes in contact, with some diminution of sensibility of the deeper structures. There is at first local pallor from contraction of vessels, followed by redness. Applied to the conjunctiva it dilates the pupil (which may, however, be contracted by eserine) transiently, lessens without entirely suspending the power of accommodation, and lowers ocular tension.

What are the medicinal uses of erythroxylon and its alkaloid?

Erythroxylon is not much employed in medicine. It may be given as a stomachic *tonic* in wasting diseases, as in *phthisis.*

Cocaine is principally used as a *local anæsthetic* (4 to 10 per cent. solution), in operations on the various mucous membranes, particularly those of the eye, nose, mouth, pharynx and larynx, but also to those of the vagina, rectum and urethra. Injected into the superficial tissues it diminishes sensation sufficiently to allow of the performance of many operations in minor surgery, particularly if its diffusion is prevented by compressing the circulation of the part. In ophthalmology it is useful both for this purpose and from its rapid and transient mydriatic effect.

To *relieve pain* and *contract the blood vessels* in the early stages of acute catarrhal inflammations, as *coryza*, *hay fever*, *laryngitis* and *bronchitis;* to deaden sensation and thus *lessen reflex cough* in *pertussis*, *influenza*, advanced *phthisis* and *chronic laryngitis*, it may be used in spray, or directly applied to the part by a brush. It has also been used as a *hemostatic*, applied to the mucous membranes, especially to the nasal mucous membrane, previous to an operation. It is highly recommended to allay the burning and itching of rhus poisoning. *Internally* it has been employed in *gastrodynia*, *nervous dyspepsia*, and to check *reflex vomiting*, as that of pregnancy or of sea-sickness (by the mouth or injected into the epigastric region), as a cardiac tonic in low fevers, and as a substitute for morphine in persons accustomed to the habitual use of the latter alkaloid. When used for this purpose the cocaine habit is apt to be formed, but can apparently be broken off suddenly without danger to the patient.

What are the preparations and doses of erythroxylon?

EXTRACTUM ERYTHROXYLI FLUIDUM (*fluid extract of erythroxylon*), dose fʒss–ij.

Cocaine hydrochlorate (not officinal), dose gr. ¼–j.

ANTIPYRINE.

Is antipyrine a mydriatic anodyne?

Antipyrine is an anodyne of considerable power, as has already been stated, and in large doses dilates the pupil, but is not used as a mydriatic.

ORDER III.—ANÆSTHETICS.

What are anæsthetics?

This name is applied to a group of medicines, the vapor of which when inhaled causes a temporary loss of sensibility to painful impressions (*analgesia*), with diminution and finally abolition of general sensation and reflex action, and lastly, complete loss of consciousness.

Name the agents of this group.

Ether, chloroform, nitrous oxide, methylene bichloride, ethyl bromide and bromoform.

ÆTHER—ETHER.

What is ether?

Ether is ethyl oxide, obtained by the distillation of alcohol with sulphuric acid.

What are its physiological effects?

When applied *locally* ether produces a feeling of coldness by its rapid evaporation, thus obtunding the sensibility of the part, and if the application be continued the part may be entirely frozen.

When the vapor of ether is *inhaled* a sense of burning is experienced in the throat, followed by a feeling of suffocation and an irritative cough; then comes a *stage of stimulation*, during which the action of the higher nerve centres is more or less interfered with, there is a feeling of lightness in the head and buzzing in the ears, and the circulation is quickened; this passes into the *narcotic stage*, the patient becoming delirious and laughing, weeping, moaning, talking, singing or fighting. The face is suffused, the eyeballs injected and often protruding, the veins turgid, sensibility is diminished, and tonic contractions of the muscles are often present. If the inhalation is continued the *stage of anæsthesia* soon supervenes, in which the functions of the spinal cord are influenced; thus, there is not only complete insensibility, but also entire abolition of the reflexes. This stage may be continued indefinitely by carefully regulating the inhalation. If, however, too much be given, the *stage of paralysis* ensues, in which the reflex centres of the medulla oblongata are paralyzed and the respiration and circulation cease. Stertorous respiration, from paralysis of the muscles of the palate, is the first indication of the approach of this stage. The *after effects* are headache, vomiting and a taste of ether in the mouth. Some hours elapse after profound anæsthesia before the patient fully regains the use of his mental faculties.

Taken *internally* ether increases the secretions and is a cerebral and cardiac stimulant, being similar in its action to alcohol.

It is rapidly *eliminated* by the lungs.

What are the therapeutical uses of ether?

1. As an *anæsthetic*, ether is employed by inhalation for the prevention of pain during *surgical operations* and examinations, and during the passage of *renal* or *biliary calculi*. For these purposes the

inhalation should be carried to the third stage—that of complete anæsthesia. To alleviate suffering during labor ether is often administered, but here it should only be inhaled during the pains, and the stage of complete anæsthesia is rarely required, unless some obstetric manipulations, as version, the application of the forceps, or craniotomy is necessary, or when it is desirable to prevent the patient from "bearing down," either from fear of laceration of the soft parts, or of the strain on the circulation in cardiac disease, or where thorough relaxation of a rigid cervix uteri is desired. 2. As a *reflex depressant* it is inhaled in various forms of *convulsions* during the paroxysms, and to promote the reduction of a hernia, or aid in diagnostic manipulations by relaxing tensely contracted muscles. In persistent hiccough it is sometimes successful when given internally, or may be used by inhalation to check the paroxysm. 3. As a *cardiac stimulant* it may be given hypodermically or by the mouth in cases of syncope or threatened cardiac failure. 4. It is sometimes used as a *tæniacide;* and, 5. it has sometimes proved useful as an *anodyne* in *neuralgia* (injected in the vicinity of the nerve), and in *nervous headache* (given internally). 6. *Locally* it is employed to relieve pain in neuralgia, myalgia, muscular rheumatism and before the performance of minor surgical operations.

What cautions should be observed in administering ether?

As ether is highly inflammable, it should not be administered by inhalation at night near a candle or gas light, nor near an open fire or very hot stove. If a light is in the room it should be placed as high as possible above the patient, as the vapor of ether sinks toward the floor. Ether is contraindicated in advanced pulmonary disease, and should be cautiously administered, if at all, in cases of cerebral tumors, grave renal disease and excessive exhaustion of the nerve centres.

In cardiac diseases it is the safest anæsthetic and may be cautiously employed.

How should alarming symptoms be treated?

(1) Stop the inhalation; (2) dash cold water on the face and chest and allow the patient plenty of fresh air; (3) use artificial respiration, give atropine hypodermically; and (4) apply the faradaic current to the thoracic muscles.

What are the officinal preparations of ether and how are they administered?

Æther Fortior (*stronger ether*) contains about 94 per cent. of purified ethyl oxide in alcohol and water.

Spiritus Ætheris (*spirit of ether*) contains 30 per cent. of stronger ether in alcohol, dose fʒss–iv.

Æther (*ether*) contains about 74 per cent. of purified ethyl oxide in alcohol and a little water; dose internally fʒss–iv, given in capsule or in ice-cold water. When *administered by inhalation*, f℥ss may be poured on a napkin or sponge placed in a cone of stiff paper, which is then applied to the patient's mouth and nose, and kept there continuously, only removing it momentarily from time to time to add more ether, until the desired effect is produced. Ether inhalations are better administered on an empty stomach, as the after effects, especially the tendency to vomiting, are thus lessened.

CHLOROFORMUM—CHLOROFORM.

What is chloroform?

Chloroform is methenyl chloride or formyl terchloride, and is obtained by distilling alcohol with chlorinated lime and slaked lime.

What are its physiological effects?

Applied *locally* it is to some extent anæsthetic; if evaporation be prevented it is an irritant and even a painful vesicant. It assists the absorption of organic alkaloids by the skin, which otherwise would not penetrate the epidermis. When the vapor of chloroform is *inhaled* anæsthesia and unconsciousness rapidly result.

The *stage of stimulation* is not as well marked as in the case of ether inhalation; the *narcotic stage* is usually short in duration and the struggles of the patient are, as a rule, not violent. The pulse is quickened and apparently strengthened until the *stage of anæsthesia*, when with the abolition of consciousness and sensation and muscular relaxation it diminishes slightly in frequency and is more or less weak. The *stage of paralysis* is one of imminent danger. In addition to the symptoms of the anæsthetic stage, there is stertorous breathing, entire abolition of the reflexes, with a weak and rapid pulse, and finally death, usually from cardiac paralysis. When *swallowed* in small doses it stimulates the secretions and increases peristalsis. In large amounts it is an irritant, causing gastro-enteritis, and after its absorption producing anæsthesia and coma. It is eliminated by the lungs and kidneys.

How do the physiological actions of ether and chloroform compare?

Ether is the safer anæsthetic; chloroform the more rapid, more transient in its effects, which are produced by smaller amounts, pleasanter, less irritating, and with less disagreeable after-effects. It does not cause so much vomiting, and its vapor is not inflammable. Death from ether (rare) is usually the result of respiratory paralysis and is gradual, while death from chloroform (much more frequent) is usually sudden, and is due to cardiac failure.

What are the therapeutical uses of chloroform?

It has been used as an *anæsthetic* by inhalation in the same range of cases in which ether is given, but its employment for this purpose is now very generally limited to diseases like puerperal eclampsia, in which it is necessary rapidly to produce anæsthesia and depress reflex action. In *obstetric practice* it is largely used, but even here ether is safer. Administered *internally* it has proved serviceable in *cholera*, *protracted diarrhœa*, and various forms of *colic*. It has also been used as a *tæniacide*. Given before the expected chill of *malarial fevers* it frequently aborts the paroxysm. Deep *injections* in the vicinity of the affected nerve sometimes afford relief in obstinate neuralgia. *Locally* as an anodyne it is employed in the form of liniment in muscular pains and in neuralgic affections. Its *contraindications* as an anæsthetic are identical with those of ether, and in addition *it should never be administered when any disease of the circulatory system exists or if the heart is feeble from any cause whatsoever.*

How should the occurrence of dangerous symptoms be met?

Stop the inhalations; invert the patient; artificial respiration; faradization; and atropine hypodermically. If it has been administered internally, treat the case as one of irritant or narcotic poisoning.

What are the officinal preparations, and how may they be administered?

CHLOROFORMUM VENALE (*commercial chloroform*) contains at least 98 per cent. of chloroform. For internal use, it is employed in the form of

CHLOROFORMUM PURIFICATUM (*purified chloroform*), dose ♏xv–fʒj, in emulsion. As an *inhalation*, 20 drops of chloroform may be poured on a folded napkin and placed cautiously over the nose and mouth in such a manner that the vapor is freely diluted with atmospheric air. *Not more than 3½ per cent. of chloroform should be contained in the air inspired.*

SIPIRITUS CHLOROFORMI (*spirit of chloroform*), dose fʒss–ij.

MISTURA CHLOROFORMI (*mixture of chloroform*), dose f℥ss.

LINIMENTUM CHLOROFORMI (*liniment of chloroform*) contains commercial chloroform 40 per cent. in soap liniment.

NITROUS OXIDE.

What is nitrous oxide?

Nitrous oxide (not officinal) or nitrogen monoxide is a colorless, almost odorless gas, made by the action of heat on ammonium nitrate.

What are its physiological actions?

When nitrous oxide is inhaled in from one to three minutes complete anæsthesia occurs with loss of consciousness, often preceded by a stage of excitement; the face is livid and the patient presents the appearance of asphyxia. The anæsthesia is probably due to diminution in the relative amount of oxygen in the blood. When the inhalation is discontinued, consciousness and sensation speedily return, and as a rule no after-effects are manifested. When death results it is generally due to asphyxia.

What are the therapeutics and the mode of administration of nitrous oxide?

As an *anæsthetic* in minor surgical operations of short duration, as the extraction of teeth or the opening of abscesses, it is advantageously employed, but when the operation necessitates the maintenance of anæsthesia for some time, ether is a safer agent.

It is best *administered* from an india rubber bag, containing at least eight gallons, furnished with a mouth-piece having two valves, so that the expired air may not pass back into the bag.

METHYLENE BICHLORIDE: ETHYL BROMIDE: BROMOFORM.

What are these substances?

Methylene bichloride (not officinal) is a neutral, colorless liquid, resembling chloroform in odor. Its vapor is inflammable. When *inhaled* it rapidly produces anæsthesia and unconsciousness, and these effects as rapidly disappear when the inhalation is discontinued. Death is due to cardiac paralysis.

It is not much employed in this country.

Ethyl bromide (not officinal) is a colorless, neutral liquid, having an ethereal odor and a disagreeable, sweetish taste. When inhaled it is anæsthetic, acting on the heart like chloroform, and seems to be fully as dangerous. It is rarely used.

Bromoform (not officinal) is a heavy liquid with an agreeable taste and smell. Its effects resemble chloroform, but are slower. It is not much used.

ORDER IV.—ANTISPASMODICS.

What are antispasmodics?

Antispasmodics are remedies which prevent or allay spasmodic action of voluntary or involuntary muscles by increasing the inhibiting power of the higher, over the lower nerve centres.

Name the antispasmodics.

Musk, valerian, the valerianates, asafœtida, camphor, oil of amber, ethereal oil and Hoffman's anodyne, cypripedium and scutellaria.

MOSCHUS—MUSK.

What is musk?

Musk is the *dried secretion* from the preputial follicles of moschus moschiferous, or musk deer.

What are its effects and uses?

Musk is a mild cerebral stimulant and antispasmodic, slightly increasing the cardiac frequency. In cases of nervous exhaustion, however, it acts more powerfully, and when a pure article can be obtained, no better nervous stimulant can be employed in the latter stages of *typhoid fever* with great depression of the vital forces, and in *typhoid pneumonia*. It is also of use in *hysteria*, *hiccough* and *chorea*.

What are the preparations of musk?

MOSCHUS (*musk*) is often adulterated, and imitations are not unfrequently substituted for the genuine article; dose gr. x–xv in capsule or emulsion. It is often given per rectum.

TINCTURA MOSCHI (*tincture of musk*), dose f℥j–ij.

VALERIANA—VALERIAN.

What is valerian, and what does it contain?

Valerian is the *rhizome* and *rootlets* of V. officinalis or wild valerian (*Nat. Ord.* Valerianaceæ). It contains a volatile oil and a colorless volatile acid (*valerianic*).

What are the effects and uses of valerian?

Large doses of valerian may cause nausea, vomiting, and sometimes colicky pains. It slightly stimulates the brain and circulation, and increases the secretions of the skin and kidneys. Its effects are more decided in nervous excitement due to depression of the cerebral functions, as in *hysteria* or "*nervousness*," and in *hypochondriasis*. It has also been used as a cerebral stimulant in the *delirium* of low fevers and in *delirium tremens*.

What are the preparations and doses of valerian?

ABSTRACTUM VALERIANÆ (*abstract of valerian*), dose gr. v–xv.

EXTRACTUM VALERIANÆ FLUIDUM (*fluid extract of valerian*), dose f℥j.

TINCTURA VALERIANÆ (*tincture of valerian*), dose f℥j.

TINCTURA VALERIANÆ AMMONIATA (ammoniated tincture of valerian), dose f℥j–ij.

OLEUM VALERIANÆ (*oil of valerian*), dose gtt. ij–v.

AMMONII VALERIANAS (*ammonium valerianate*) is much used in *hysteria*, *neuralgia* and *nervous headache*; dose gr. ij–x, in capsules or elixir.

Iron valerianate and *quinine valerianate* have already been considered: *zinc valerianate* will be noticed under the zinc preparations.

ASAFŒTIDA—ASAFETIDA.

What is asafetida, and of what is it composed?

Asafetida is a *gum-resin* obtained from the *root* of Ferula Narthex and F. Scorodosma (*Nat. Ord.* Umbelliferæ), natives of Afghanistan. It is composed of a gum-resin united to a volatile oil.

What are its effects and uses?

It is a gastric stimulant and carminative, and produces a sense of exhilaration. It increases the mucous secretions and peristalsis, and in large doses quickens the pulse and respiration. Very large doses may cause nausea and vomiting.

It is *used* as an *antispasmodic* in *hysteria* and *nervous exhaustion*; as a *carminative* in *tympanites* (by the rectum); as a *stomachic tonic* in *dyspepsia* with flatulent colic, and as an *expectorant* in *chronic bronchitis* and in *whooping-cough*, where it also acts as an antispasmodic.

What are its preparations and doses?

MISTURA ASAFŒTIDÆ (*mixture of asafetida—lac asafœtidœ*), dose f℥ss–j, or as an enema f℥ij–iv.

PILULÆ ASAFŒTIDÆ (*pills of asafetida*), each pill containing gr. iij of asafetida; dose No. ij–iv.

TINCTURA ASAFŒTIDÆ (*tincture of asafetida*) contains 20 per cent. of asafetida; dose fʒss–j.

EMPLASTRUM ASAFŒTIDÆ (*plaster of asafetida*), used externally in whooping-cough and bronchitis.

PILULÆ ALOES ET ASAFŒTIDÆ (*pills of aloes and asafetida*), each pill contains of aloes, asafetida and soap gr. j½ each.

MISTURA MAGNESIÆ ET ASAFŒTIDÆ (*mixture of magnesia and asafetida—Dewees' Carminative*) contains magnesium carbonate 5 per cent., tincture of asafetida 7 per cent., tincture of opium 1 per cent., sugar and distilled water. A good remedy in flatulent colic; dose fʒj–iv, according to the amount of opium desired.

CAMPHORA—CAMPHOR.

What is camphor?

Camphor is a *stearopten*, derived from Camphora Cinnamomum, or camphor laurel (*Nat. Ord.* Lauraceæ), an evergreen tree of China and Japan. It is obtained by boiling chips of the tree in water and skimming off the camphor as it rises to the surface. This *crude camphor* is afterward *refined* by sublimation with quicklime.

What are the physiological effects of camphor?

Locally camphor is an irritant. *Internally in moderate doses* it is to some extent an anodyne and a cerebral exhilarant, sometimes quickening the pulse and raising arterial tension, and occasionally proving aphrodisiac. In *large doses* (gr. xx) it depresses the circulation, and produces lassitude and diaphoresis. It is also anaphrodisiac. In *toxic doses* (ʒss–j) it causes faintness, vertigo, headache, delirium, violent epigastric pain, unconsciousness and sometimes convulsions. No case is recorded to have proved fatal in an adult.

What are the medicinal uses of camphor?

It is employed as an *antispasmodic* in "*nervousness*," *nervous headaches*, *hysterical complaints*, *dysmenorrhœa*, "*after-pains*," simple *diarrhœa*, and combined with other remedies in *cholera*. It is also used in *low forms of fever*, to quiet delirium and sustain the system. As an *anaphrodisiac* to quiet abnormal sexual excitement in *chordee*, *nymphomania* and *priapism*. *Externally* it is employed as a liniment in myalgia, muscular rheumatism and sprains. Dissolved in oil of turpentine it forms an efficient liniment in mild bronchial affections.

What are its preparations and their doses?

Camphora (*camphor*); dose gr. j–x, or even gr. xx given in emulsion, or in pill or capsule. Not much used in this form.

Aqua Camphoræ (*camphor-water*) contains 1 part of camphor in 125 parts of the preparation; dose f℥ss–ij. It is used chiefly as a vehicle or where a mild antispasmodic is needed.

Spiritus Camphoræ (*spirit of camphor*) contains 10 per cent. of camphor. It is used as an embrocation, and is also given internally where a stronger preparation than the water is desired; dose ♏v–fʒj.

Linimentum Camphoræ (*camphor-liniment*) contains 20 per cent. of camphor in cottonseed oil.

Ceratum Camphoræ (*camphor-cerate*) contains 3 per cent. of camphor-liniment.

Linimentum Saponis (*soap-liniment*) is much used externally, either alone or combined with stronger liniments.

Camphora Monobromata (*monobromated camphor*); dose gr. v–x in gelatin-coated pill or capsule. It is useful as an antispasmodic in *hysteria*, and as an anaphrodisiac in *chordee* and *priapism*.

Hope's Camphor Mixture (not official) consists of nitrous acid fʒj; laudanum ♏xij; camphor-water f℥viij; dose, f℥ss, repeated as required. Much used in diarrhœa and dysentery.

OLEUM SUCCINI—OIL OF AMBER.

What is oil of amber?

It is a *volatile oil* obtained by *destructive distillation* of amber, and purified by subsequent rectification.

Externally it is a powerful irritant. *Internally* it is a cerebral stimulant and antispasmodic. It is *used internally* in *whooping cough*, *hiccough*, *hysteria* and *infantile convulsions*, and *locally* in *chronic rheumatism*, *whooping cough* and other diseases as a rubefacient, diluted with from 1 to 3 parts of olive oil; dose internally gtt. v–xx in emulsion.

OLEUM ÆTHEREUM—ETHEREAL OIL.

What is ethereal oil?

Ethereal oil, or oil of wine, is made by distilling alcohol with an excess of sulphuric acid and diluting with an equal volume of stronger ether, and is a nearly colorless volatile liquid. It is antispasmodic, and in small doses a cardiac and vaso-motor stimulant, while in large doses it paralyzes the cardiac muscle and the vasomotor nerves. It is only used medicinally as

SPIRITUS ÆTHERIS COMPOSITUS—COMPOUND SPIRIT OF ETHER.

What is this substance?

Compound spirit of ether, or *Hoffman's anodyne*, is a solution, ethereal oil (3) in stronger ether (30) and alcohol (67), and is a good antispasmodic, circulatory stimulant and carminative, and is useful in the class of diseases to which antispasmodics are applicable, especially when a cardiac stimulant is required; dose fʒj–ij repeated, and best administered in iced water.

CYPRIPEDIUM : SCUTELLARIA.

What are these remedies?

Cypripedium is the *rhizome* and *rootlets* of C. pubescens and of C. parviflorum (*Nat. Ord.* Orchidaceæ), indigenous plants, commonly called ladies' slipper and moccasin plant. *Scutellaria* is the *herb* S. laterifolia or skullcap (*Nat. Ord.* Labiatæ), an indigenous herb. They possess mild antispasmodic properties, and have been used as substitutes for valerian.

nerve centres, it is *contraindicated* whenever inflammation or excitation of these centres is present; hence, in paralyses due to clots, it may do great injury if too early exhibited. In *constipation* due to atony and relaxation of muscular fibres, or in *diarrhœa*, *dysentery*, *impotence*, or *incontinence of urine* from the same cause, it is very useful. (2) In *amaurosis*, especially when due to the abuse of tobacco or of alcohol, and in *amblyopia* from disease, strychnine pushed to the verge of tolerance is very efficacious. It is more useful before atrophy of the optic nerve fibres has occurred. (3) As a *cardiac* and *respiratory stimulant* in *dyspnœa* depending on chronic bronchitis, emphysema, phthisis, or due to cardiac disease, as fatty or dilated heart, it is of value, and is often combined or alternated with digitalis in the latter affection. (4) As a *general tonic* it is advantageously given in *atonic dyspepsia*, *gastric catarrh*, *anæmia* and *chlorosis* (combined with iron), as an adjunct to quinine in obstinate *malarial fevers*, in various *neuralgiæ* occurring in debilitated subjects, and in *convalescence* from acute diseases (combined with iron and other tonics). Minute doses of nux vomica (tincture) will often arrest the *vomiting of pregnancy*.

What are the officinal preparations and their doses?

ABSTRACTUM NUCIS VOMICÆ (*abstract of nux vomica*), dose gr. ss–ij.

EXTRACTUM NUCIS VOMICÆ (*extract of nux vomica*), dose gr. $\frac{1}{4}$–j, given in pill. It is frequently combined with purgatives to enhance their effect.

EXTRACTUM NUCIS VOMICÆ FLUIDUM (*fluid extract of nux vomica*), dose ♏ij–v.

TINCTURA NUCIS VOMICÆ (*tincture of nux vomica*), dose ♏j–xx. Chiefly used as a bitter tonic.

STRYCHNINA (*strychnine*), preferably given as—

STRYCHNINÆ SULPHAS (*strychnine sulphate*), dose gr. $\frac{1}{30}$–$\frac{1}{20}$, internally, or gr. $\frac{1}{60}$, cautiously increased, if used hypodermically. As a tonic, minute doses may be given in pill, alone or combined with other medicines. In nervous affections, it should be given in solution, the dose being gradually increased until slight muscular twitchings are produced.

Iron and strychnine citrate and *syrup of iron, quinine and strychnine phosphates* have been noticed with the iron preparations.

IGNATIA.

What is ignatia?

Ignatia is the *seed* of Strychnos Ignatii or St. Ignatius' bean (*Nat. Ord.* Loganaceæ), a tree of the Philippine Islands. It contains *strychnine* and *brucine* combined with *igasuric acid*, and consequently is identical in its effects with nux vomica and is used to fulfill the same indications. It is an excellent stomachic tonic in nervous dyspepsia.

ABSTRACTUM IGNATIÆ (*abstract of ignatia*), dose gr. ¼–j.

TINCTURA IGNATIÆ (*tincture of ignatia*), dose ♏v–xx.

RHUS TOXICODENDRON.

What is this substance?

It is the *fresh leaves* of the Rhus Toxicodendron, poison-oak or poison-ivy (*Nat. Ord.* Terebinthaceæ), which contains *toxicodendric acid*. *Locally* applied it produces in many persons a very distressing eczematous eruption attended with much inflammation and swelling of the skin. Some persons are so susceptible that these symptoms occur if they are in the vicinity of the growing plant, even without coming in contact with it.

The treatment consists in alkaline washes, lotions of lead or corrosive sublimate (1 to 8000 or even weaker) or the application of carbolic acid in glycerin. *Internally* it is a gastro-intestinal irritant, causing also drowsiness, stupor, delirium and convulsions. Its precise use is not clear, but it has been given as a substitute for nux vomica in *paralysis* and in *incontinence of urine*. *Dose* gr. j–iij, perhaps, if given at all; best administered in the form of a tincture.

PICROTOXINUM—PICROTOXIN.

What is picrotoxin?

Picrotoxin is a *neutral principle* prepared from the seeds of Anamirta paniculata (*Nat. Ord.* Menispermaceæ), a climbing shrub of India. Its *action* on the brain resembles that of belladonna, while it affects the spinal centres somewhat like nux vomica: thus, it causes nausea, vertigo, delirium, incoördination, muscular twitching, followed by epileptiform convulsions, alternating tonic and clonic spasms, coma and cardiac paralysis. It stimulates all the motor and inhibitory centres of the medulla, particularly the respiratory and vagus centres, and excites the motor and reflex spinal centres. It is at present chiefly used to check the *night-sweats of phthisis*, but has also been recommended as an *excito-motor* in *functional paralysis* and in *paralysis* or *relaxation of the sphincters.* It is said to be of service in *chorea* when given in full doses. *Locally* it is used as an ointment (gr. v–x to f℥j) in parasitic skin diseases and to destroy pediculi, but care should be used in applying it, as constitutional effects and even death have followed its employment externally. *Dose* gr. $\frac{1}{200}$–$\frac{1}{60}$.

ORDER VI.—DEPRESSO-MOTORS.

What are depresso-motors?

They are remedies which are used to depress the functions of the spinal cord, motor nerves or muscles, thus lessening motivity.

Name the members of this group.

Physostigma; chloral; the bromides; the nitrites; gelsemium; prussic acid; the cyanides; oil of bitter almonds; lobelia; conium; woorara, and tobacco.

PHYSOSTIGMA.

What is physostigma, and what active principles does it contain?

Physostigma, or Calabar bean, is the *seed* of P. venenosum (*Nat. Ord.* Leguminosæ), a plant found on the western coast of Africa. It contains an alkaloid called *eserine* or *physostigmine*, and it is claimed that a second alkaloid (a tetanizing agent), called *calabarine*, has also been discovered, but this is probably a derivative-alkaloid of eserine.

What are the physiological effects of physostigma?

Calabar bean is a reflex depressant, causing also, in full doses, giddiness, slow and often irregular pulse, great muscular weakness, nausea and sometimes vomiting, generally free purgation, and usually contraction of the pupils. When poisonous doses are taken, there are, in addition, muscular tremors and abolition of reflex action, slow pulse and respiration, myosis and motor paralysis, and death from respiratory failure.

It depresses and finally paralyzes the *reflex and motor centres of the spinal cord*, having but slight effect upon the nerves themselves. It slows the heart (by greatly lengthening the diastolic pause) and increases its power (acting either on the cardiac motor-ganglia or muscle). The *blood pressure* at first falls, but soon rises and remains high until death approaches. It stimulates *intestinal peristalsis* and increases the secretions of the part. On the *eye* its action is probably directly opposed to that of atropine, for no matter how used it contracts the pupil, probably by paralyzing the peripheral sympathetic nerve-fibres in the iris and at the same time stimulating the end organs of the 3d pair of nerves. It is probably *eliminated* by the urine.

How should poisoning by this drug be treated?

(1) Give emetics and cathartics, and use a catheter to prevent further absorption of poison, and (2) use atropine hypodermically as a physiological antagonist.

For what purposes is it employed medicinally?

As a *depresso-motor* it is used in *tetanus*, *trismus neonatorum*, *epilepsy* and *chorea* with some success. It has also been given as a physiological antagonist in *strychnine poisoning*, but is probably inferior to chloral for this purpose.

From its influence over *intestinal peristalsis*, it is advantageously used in *habitual constipation*, especially when associated with chronic intestinal dyspepsia and dry, hard stools. The *alkaloid* is used in ocular therapeutics, to prevent or overcome adhesions of the iris, lessen tension and contract the pupil.

What are its preparations and doses?

EXTRACTUM PHYSOSTIGMATIS (*extract of physostigma*), dose gr. $\frac{1}{12}$–$\frac{1}{2}$.

TINCTURA PHYSOSTIGMATIS (*tincture of physostigma*), dose ♏v–xxx.

PHYSOSTIGMINÆ SALICYLAS (*physostigmine salicylate*), dose gr. $\frac{1}{60}$–$\frac{1}{12}$.

CHLORAL and THE BROMIDES have been discussed under the head of *hypnotics* (*vid.* pp. 89, 90).

THE NITRITES.

What are the nitrites?

The *nitrites* are salts formed by the union of *nitrous acid** with a base.

Amyl nitris (*amyl nitrite*) is the only officinal nitrite (except the sweet spirits of nitre, which contains ethyl nitrite and will be considered elsewhere). It is a yellowish, oily, very volatile liquid, with a pleasant, fruity odor. *Nitroglycerin* (*trinitrin*, *trininitroglycerin* or *glonoin*) is a colorless, oily liquid, without odor, soluble in ether and alcohol. It forms the basis of various explosives. It is really a *nitrate* (not a *nitrite*) of glyceryl. *Potassium and sodium nitrites* are also used.

What is the physiological action of the nitrites?

They cause vertigo, headache, excited cardiac action, great dilatation of the arterioles and capillaries (from paralysis of their muscular coats), and consequently greatly diminished blood pressure, slowed respiration, lowered temperature, and diminished reflexes. After toxic doses, the pupils dilate, the muscular system relaxes, the blood becomes darker (probably from the formation of methemoglobin), the respiration and circulation become slow and irregular, and finally death occurs from respiratory failure, sensation and consciousness being preserved to the last. They depress both the *motor and reflex spinal* centres without influencing either the sensory nerves or centres. They probably first stimulate the *heart*, but soon depress and finally paralyze the cardiac muscle by direct action. The *temperature* is lowered, owing to lessened oxydation. The nitrites are all *muscle poisons.* They are *eliminated* by the urine, increasing greatly the amount of water and the uric acid and urea. The action of *amyl nitrite* is the most rapid, but most transient; *nitroglycerin* is the slowest, but its effects are more lasting,—the headache, however, which it causes, is very persistent, and often constitutes a great objection to its use. It sometimes causes nausea and vomiting.

What are the therapeutical uses of the nitrites?

The nitrites are used (1) as *depresso-motors* to relax spasm in

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* See foot-note on p. 71.

angina pectoris, *asthma*, *tetanus*, puerperal and other forms of *convulsions*, *strychnine poisoning*, congestive and nervous *dysmenorrhœa*, and in all cases of very *high arterial tension* from spasm of the arterioles; thus, in *renal asthma* the inhalation of a few drops of amyl nitrite quickly relieves the spasm, and *migraine* with capillary spasm is frequently benefited by it. Given just before the expected chill of *malarial fevers* it will abort it, and sometimes avert the paroxysm. If amyl nitrite is inhaled when the "aura epileptica" is experienced, it will often prevent the *epileptic* attack. Nitroglycerin has proved of value in *chronic interstitial nephritis*, lessening the albuminuria and relieving the arterial spasm. Obstinate *hiccough* has been benefited by nitroglycerin.

(2) As *cardiac stimulants* the nitrites are employed in *syncope*, *cardiac dyspnœa*, and in *threatened cardiac failure* during the administration of anæsthetics, especially chloroform.

(3) They have also been found useful in the *nausea and vomiting* of sea-sickness and of pregnancy.

What are the doses of the nitrites, and how are they administered?

AMYL NITRIS (*amyl nitrite*), dose ♏ij–v.

Potassium nitrite and *sodium nitrite* (neither of which are officinal), dose gr. ij–iij.

Nitroglycerin (not officinal) is kept in the shops as a 1 per cent. alcoholic solution, the dose of which is ♏ss cautiously increased.

Amyl nitrite is usually given by *inhalation*, but may be administered internally on sugar, or even hypodermically. The other preparations are given by the mouth. If a speedy action is required amyl nitrite should be used, and after the immediate danger is over, if it is desired to maintain the effect, the other nitrites or nitroglycerin may be given.

GELSEMIUM.

What is gelsemium, and what chemical principles does it contain?

Gelsemium is the *rhizome* and *rootlets* of G. sempervirens, the yellow or Carolina jasmine (*Nat. Ord.* Loganaceæ), a climbing plant of the Southern States. It contains an alkaloid, *gelsemine*, combined with *gelseminic acid*, a volatile oil, resin, etc.

What are its physiological effects?

Small doses produce languor, dizziness, and perhaps slight lowering of the pulse rate; *large doses* diminish the force and frequency of the pulse and lower arterial pressure, depress respiration, cause frontal headache, and disordered, usually double vision; *toxic doses* cause extreme muscular weakness, partial blindness, dilated pupil, often internal strabismus, ptosis, incoördination, the jaw drops, articulation is impaired, general sensibility is much diminished, respiration is slowed, the pulse is very feeble, the temperature declines, a profuse cold sweat breaks out, and death occurs from respiratory failure, preceded in animals by convulsions followed by general paralysis. The mind remains clear until the end approaches. The paralyses of sensation and of motion appear to be of *spinal origin*, and the convulsions in animals have been attributed to excitation of the reflex spinal centres from *gelseminic acid*, which is supposed to be a tetanizing agent. The *respiratory centre* is depressed and finally paralyzed. The poison appears in toxic doses to depress the *heart* directly. It paralyzes the end-organs of the motor oculi, thus causing mydriasis with paralysis of accommodation and ptosis, and must also act on the 6th nerve, as the action of the external rectus muscle is much enfeebled.

What are its therapeutic uses?

It has been used as a *motor depressant* in *asthma*, *laryngismus stridulus*, *pertussis*, and *nervous cough* and *tic douloureux*; as a *sensor-depressant* in *trigeminal neuralgia*, especially when associated with spasm, and in various other *neuralgic affections*; as a *calmative* in *mania* (full doses); as a *cardiac sedative* in *sthenic fevers* and *inflammations*, and in *ocular therapeutics*. Its chief use is in neuralgia, especially of the 5th nerve.

What are its preparations and their doses?

EXTRACTUM GELSEMII FLUIDUM (*fluid extract of gelsemium*), dose ♏v–x (f℥j has proved fatal), repeated every 2 or 3 hours until constitutional effects are produced.

TINCTURA GELSEMII (*tincture of g* ♏v–xx.

ACIDUM HYDROCYANICUM DILUTUM—DILUTED HYDROCYANIC ACID.

What are the sources of hydrocyanic acid?

Hydrocyanic or prussic acid exists in bitter almonds, peach kernels and leaves, wild cherry, etc., but is used in medicine only in a very diluted solution. The *diluted acid* is formed by the reaction of sulphuric acid and water upon potassium ferrocyanide or of hydrochloric acid on silver cyanide, and is a colorless, volatile liquid with an odor resembling that of bitter almonds. It contains 2 per cent. of the absolute acid.

How may the presence of prussic acid be detected?

1. The addition of a solution of silver nitrate produces a white precipitate entirely soluble in boiling concentrated nitric acid. 2. The addition of a small amount of a mixed solution of ferrous and ferric sulphate, and afterward a little liquor potassæ, gives a dirty, greenish-blue precipitate, which changes to Prussian blue when slightly acidulated with hydrochloric acid.

What are its physiological effects?

Locally applied it passes through the cuticle and paralyzes the end-organs of the sensitive nerves beneath. When its vapor is inhaled or when the acid is taken in sufficient doses, it kills almost immediately, from arrest of circulation. If the toxic dose has not been large enough to arrest the circulation instantly, dyspnœa and depression of the heart occur, followed by dilated pupils, convulsions and unconsciousness, and death from asphyxia and collapse.

The convulsions are of *cerebral* origin. Prussic acid is a direct nerve and muscle poison. In large doses it causes diastolic arrest by direct action either on the *heart muscle* or its contained ganglia : in small doses it slows the heart by stimulation of the inhibitory centres. It stimulates at first the vaso-motor system and for a short time raises arterial tension, but it soon depresses and finally paralyzes the vaso-motor apparatus and the blood pressure falls. The venous blood at first becomes of an arterial hue but soon darkens, and after death even the arterial blood has lost its bright color. The cause is not well understood. Asphyxia is due to paralysis of the respiratory centre. It is rapidly eliminated by the lungs and kidneys.

How should poisoning by prussic acid be treated?

Evacuate, if possible, the contents of the stomach; give atropine hypodermically as a respiratory stimulant; give ammonia freely by inhalation, by the mouth and by intra-venous injection; practice artificial respiration assiduously and use alternate hot and cold douches. Death usually results so rapidly that nothing is of much service.

What are the medicinal uses of diluted hydrocyanic acid?

It is used (1) as a *depresso-motor* and *nerve sedative* in various forms of *cough*, as that of phthisis, also in *asthma* and in *whooping* cough. In obstinate *vomiting* it is sometimes successful. In *gastrodynia* and in *enteralgia* it has proved beneficial, probably by a local action on the nerves of the parts. When successful in these cases, it is so speedily.

(2) *Locally* (f℥j–iij to Oj) it is used as an *anodyne* in neuralgia and in many cutaneous affections attended with pruritus. Great caution should be used when it is thus applied, as fatal results have attended its absorption through an abraded surface.

How is it administered?

ACIDUM HYDROCYANICUM DILUTUM (*diluted hydrocyanic acid*), dose gtt. j–iij, diluted.

THE CYANIDES.

What are the effects, uses and doses of the cyanides?

POTASSII CYANIDUM (*potassium cyanide*). *Locally* it is an irritant. It may be absorbed through the skin, when the application is prolonged, and cause poisoning. When administered *internally* it reacts with the acids of the gastric juice and prussic acid is set free, consequently the systemic effects are identical with those of that acid, as a substitute for which it is used. Dose gr. $\frac{1}{12}$–$\frac{1}{8}$.

ARGENTI CYANIDUM (*silver cyanide*) is only used in medicine in making prussic acid.

Mercury cyanide has been noticed among the mercurial preparations.

OLEUM AMYGDALÆ AMARÆ—OIL OF BITTER ALMONDS.

What are the effects, uses and dose of this oil?

Oil of bitter almonds is a volatile oil obtained by distillation from the *kernel* of the fruit of Amygdalus communis (*var.* Amara., *Nat.*

Ord. Rosaceæ). It contains *benzoic aldehyd* and *hydrocyanic acid* (due to the reaction of *amygdalin* with water, in the presence of an albuminous ferment called *emulsin*). Its effects and uses are the same as those of prussic acid. *Dose* ♏¼–ss in emulsion.

Aqua Amygdalæ Amaræ (*bitter almond water*) contains 1 per cent. of the oil, and is used as a vehicle; dose f℥ss–j.

Syrupus Amygdalæ (*syrup of almonds*), made from both sweet and bitter almonds, is used as a vehicle.

LOBELIA.

What is lobelia, and what are its active ingredients?

Lobelia is the *leaves* and *tops* of L. inflata, or Indian tobacco (*Nat. Ord.* Lobeliaceæ), an indigenous plant. It contains a *liquid alkaloid*, *lobeline;* also *lobelic acid*, fixed and volatile oils, etc.

What are its effects and uses?

In *large doses* it causes nausea, violent vomiting with great depression, sometimes purging, feeble pulse, almost complete muscular relaxation, and, if a *lethal dose* has been taken, collapse, coma, sometimes preceded by convulsions, and death from paralysis of the respiratory centre.

Large doses appear to paralyze the motor nerves, the vaso-motor centre and the peripheral vagi. Its action has not been fully studied.

The *treatment of lobelia poisoning* consists in emetics, tannic acid, morphine, alcohol, ammonia and counter-irritation to the surface.

It is *used* as a *depresso-motor* and *expectorant* in *asthma* and in *acute bronchitis* with spasmodic dyspnœa. In other spasmodic diseases it has been superseded by more reliable and less dangerous remedies. It is too depressing in its action to be used as an emetic.

Locally, in infusion (℥j to Oj), it is highly recommended as an application to *poison-oak eczema*.

What are the preparations of lobelia and their doses?

Extractum Lobeliæ Fluidum (*fluid extract of lobelia*), dose as an *expectorant* ♏j–v; as an *emetic* ♏xv–xx.

Tinctura Lobeliæ (*tincture of lobelia*), contains 20 per cent. of lobelia; dose as an *expectorant* ♏x–xx; as a *motor-depressant* in asthma fʒj repeated every ½–1 hour until nausea is experienced.

Acetum Lobeliæ (*vinegar of lobelia*), dose ♏x–xxx.

CONIUM.

What is conium, and what active principles does it contain?

Conium is the *full-grown fruit* of C. maculatum, or hemlock (*Nat. Ord.* Umbelliferæ), gathered while yet green and carefully dried. The *active principle* is *conine*, a volatile *liquid alkaloid.* It also contains *conhydrine* and *methyl-conine.*

What are its physiological effects?

Full medicinal doses cause great muscular weakness, first felt in the lower extremities, difficulty in keeping the eyelids raised, and disordered vision from paralysis of accommodation. Sometimes the pupils dilate, and sometimes there is nausea and vomiting. After a *poisonous amount* has been taken, these symptoms are intensified, and difficulty of speech, delirium or coma, paralysis, and death from asphyxia, preceded by convulsions of cerebral origin, occur. Conium has little if any action on the *cerebral hemispheres*, and but little is known of its influence on the *spinal cord.* It paralyzes the peripheral ends of *nerves*, acting much more powerfully on the motor than on sensory fibres. The effects on the *ocular apparatus* are due to peripheral oculo-motor paralysis. The *pulse* is at first accelerated (paralysis of the vagi), but afterward slowed (depression of cardiac-motor nerves), and the blood pressure, which was primarily lowered, is raised when symptoms of asphyxia take place. It is eliminated by the urine. The *treatment of poisoning* consists in evacuating the contents of the stomach, giving tannic acid as an antidote, maintaining artificial respiration and administering, as antagonists, atropine, and strychnine or picrotoxin.

What are the medicinal uses of conium?

Conium has been used as a *depresso-motor* in *whooping-cough*, *paralysis agitans*, *chorea*, *blepharospasm*, *asthma* and other spasmodic affections. It has been used as a *calmative* and *relaxant* in *maniacal* and *hysterical excitement*, and also in *melancholia.* As an *anodyne* it is employed internally and locally in *cancer*, and in *neuralgia*, especially *sciatica.*

What are the preparations and doses of conium?

ABSTRACTUM CONII (*abstract of conium*) [illegible]–ij.

EXTRACTUM CONII ALCOHOLICUM (*alcoholic extract of conium*), dose gr. j.

EXTRACTUM CONII FLUIDUM (*fluid extract of conium*), dose ♏j–v.

TINCTURA CONII (*tincture of conium*), dose f℥ſs–j.

As different samples of the drug vary much in the amount of conine contained, it is safer to begin with a small dose, to be gradually increased until some effect is obtained.

WOORARA.

What is woorara?

Woorara (not officinal), called also woorali and curare, is an extract prepared by the South American Indians from Strychnos toxifera and other species of Strychnos (*Nat. Ord.* Loganaceæ), and is used by them as an arrow-poison. It *contains* an alkaloid called *curarine.*

What are its effects and uses?

It is eliminated so rapidly that usually when administered internally no symptoms result. When it enters the system through a wound or by hypodermic injection it paralyzes the peripheral endings of the *motor nerves*, and if the dose be sufficiently large the *vagus* and the ends of the *sensory nerves* are also paralyzed. After a time the *nerve trunks* and the *spinal cord* are also affected. The *voluntary muscles* are uninfluenced. Large amounts lower the *blood pressure* and finally depress the *heart.* Death results from paralysis of the motor respiratory nerves. Small doses increase all the secretions. It is *eliminated* chiefly by the urine.

The *treatment of woorara-poisoning* consists in frequent catheterization to prevent resorption, artificial respiration, and atropine and strychnine, hypodermically as antagonists. They can scarcely be relied on.

Woorara is *used* as a *depresso-motor* in *tetanus* and in *hydrophobia*, and has also been employed in *epilepsy* and in *chorea.* It is given in doses of gr. $\frac{1}{10}$, or its alkaloid, curarine, may be used in doses of gr. $\frac{1}{200}$–$\frac{1}{100}$.

TABACUM—TOBACCO.

What is tobacco, and what does it contain?

Tobacco is the *dried leaves* of Nicotiana Tabacum (*Nat. Ord.* Solanaceæ). It contains *nicotine*, a volatile *liquid alkaloid; nicotianin* (tobacco-camphor) and an empyreumatic oil.

What are its effects and uses?

To persons unaccustomed to its use, tobacco or nicotine is a depressant, nauseant and emetic, and causes dizziness and weakness. When a toxic dose is taken, purgation, diuresis, cramps or convulsions, followed by great muscular weakness and, finally, paralysis, a rapid, feeble and compressible pulse, collapse and death from paralysis of the respiratory muscles.

It first stimulates the *spinal* centres (thus causing convulsions), but probably finally paralyzes them. It first excites and then abolishes the functions of the peripheral endings of motor nerves, the nerve trunks being afterward affected, but has no influence on voluntary muscles. The *cardiac* action is first depressed from some unexplained cause, afterward much increased, probably from paralysis of the peripheral inhibitory nerves, and the blood pressure, which at first falls, is afterward elevated. Nicotine contracts the pupil, whether applied locally or administered internally.

Tobacco increases intestinal peristalsis, and is probably eliminated chiefly by the urine, which it greatly increases.

The *treatment of nicotine poisoning* consists in emetics or washing out the stomach, tannic acid and strychnine with artificial respiration.

Tobacco is not much *used* at present as a *depresso-motor*, but may be employed for this purpose in *tetanus* and in *strychnine poisoning.* In persons unaccustomed to its use, smoking a strong cigar may relieve an attack of *spasmodic asthma.* As a *local anodyne*, it has been used as a poultice to *painful ulcers*, as an ointment to inflamed *hemorrhoids*, and as a lotion to relieve *pruritus.* Great caution should be observed, as its local use has resulted in poisoning and death. There are no *officinal preparations.* Dose gr. j–iij, in infusion, which in poisoning by strychnine or in tetanus must be frequently repeated until some results are obtained.

(B) ON THE ORGANS OF CIRCULATION.

ORDER I.—CARDIAC STIMULANTS.

What are cardiac stimulants?

They are medicines which are administered with a view of increasing the power of the heart or the force of the circulation.

Mention the remedies of this order.

Alcohol, ether, the ammonium preparations, atropine, digitalis, caffeine, adonidine, strophantus, sparteine, strychnine, cimicifuga.

ALCOHOL.

What is alcohol?

Alcohol (ethyl hydrate) results from the fermentation of substances containing grape sugar. It is a colorless inflammable liquid, uniting in all proportions with water. *Alcohol* contains 96 per cent. of absolute alcohol, which is not used in medicine.

What are the physiological effects of alcohol?

Locally applied it is an astringent. It evaporates rapidly and produces a feeling of cold, but if evaporation is prevented it acts as an irritant. When its vapor is *inhaled* it causes anæsthesia, coma and death. Taken *internally in small doses* it increases appetite and digestion, temporarily increases the force and frequency of the cardiac systole, dilates the vessels, thus causing a sensation of warmth, and diminishes the amount of urea and of carbonic acid eliminated. The *continued use* of small doses disorders the digestion and the hepatic functions, produces gastric catarrh and hyperplasia of the connective tissues, resulting in sclerosis of different viscera, and tends to the production of fatty degeneration of the walls of the vessels and various organs.

Large doses disorder digestion and cause the well-known alcoholic intoxication with muscular incoördination and weakness, hallucinations, lowered temperature, depression of the heart and reflexes, and stupor.

After toxic doses death from respiratory or cardiac failure may rapidly result, preceded by insensibility, stertorous breathing and coma, and occasionally by convulsions.

In small doses it stimulates the *cardiac* motor ganglia and the heart muscle, followed, if a large dose be taken, by depression and paralysis of the cardiac muscle. Large doses also paralyze the vasomotor system and dilate the vessels.

Small doses slightly increase the *temperature* of the body, but large doses reduce it by interfering with the oxygen-carrying function of the red corpuscles and with the nutritive process, and by dilating the cutaneous vessels. *Respiration* is first quickened, then slowed, and after fatal doses, paralyzed. It is a *cerebral* stimulant, but in toxic doses depresses the encephalic mass, the *spinal* reflex centres, the conductivity of both motor and sensory nerves, and finally the reflex functions of the medulla. It diminishes the *excretion* of nitrogenized waste, and is *eliminated* principally by the kidneys, lungs and skin, although a certain amount (more in proportion to the smallness of the dose) disappears in the system.

How should acute alcohol-narcosis be treated?

The contents of the stomach should be evacuated, ammonia or strychnine should be given, and the hot and cold douche alternately used.

What are the medicinal uses of alcohol?

As a *cardiac stimulant*, alcohol is used in *syncope* from exhaustion, loss of blood, surgical shock and other forms of fainting, and where *cardiac failure* is threatened, as in typhoid and typhus fevers.

As a *general stimulant* to the system in all *wasting diseases*, as *phthisis*, *scrofula* and prolonged *suppuration*, and in all low states of the system, as *typhoid* and *typhus fevers*, *diphtheria*, *pyœmia* and *septicœmia*. In these fevers a tolerance to alcohol is present, and it may be given in large quantities without causing intoxication. It not only aids the digestion of food in these conditions, but as very little of what is taken can be found in the excretions, it seems to be used by the system, and consequently may be classed *as a food* in these diseases. The dose in these diseases must be regulated by the pulse principally. When the pulse is quickened and more bounding, the face flushes, the temperature rises, and the breath smells strongly of alcohol, the patient is taking more than the system can use, and the dose should be decreased.

As an antidote to *snake bite* or other cardiac depressant, as *aconite* or *veratrum viride*, it is of great service. In poisoning by snake bite it is given in frequently repeated doses almost *ad libitum*, conjoined with intravenous or, at least, hypodermic injection of ammonia.

To *improve digestion* and *nutrition*, it is useful in many chronic diseases, but the danger of forming the alcohol habit should always be borne in mind when it is thus prescribed.

Locally, alcohol is used as an *antiseptic* and *stimulant* dressing for wounds, to harden the cuticle when *bed sores* are imminent, and as a *tonic* and *cooling lotion*.

What are the officinal preparations of alcohol?

ALCOHOL (*alcohol*) contains 94 per cent. by volume of absolute alcohol; sp. gr. 0.820.

ALCOHOL DILUTUM (*diluted alcohol*) contains 50 per cent. of alcohol; sp. gr. 0.920.

SPIRITUS FRUMENTI (*whiskey*), an alcoholic liquid obtained by distillation from grain, and at least 2 years old; it contains 50 to 58 per cent. by volume of alcohol; sp. gr. 0.917–0.930.

SPIRITUS VINI GALLICI (*brandy*) an alcoholic liquid obtained by the distillation of fermented grapes, and at least 4 years old; it contains from 46 to 55 per cent. by volume of alcohol; sp. gr. 0.925–0.941. It contains some tannic acid, and is, therefore, astringent. It is, therefore, preferable to whiskey if there is looseness of the bowels. It also is a stomachic sedative, and, next to champagne, tends to check vomiting more than any other alcoholic liquid.

VINUM ALBUM (*white wine*), made by fermenting the juice of the grape, contains 10 to 12 per cent. by weight of absolute alcohol.

VINUM ALBUM FORTIUS (*stronger white wine*), contains 20 to 25 per cent. by weight of absolute alcohol.

VINUM RUBRUM (*red wine*), made by fermenting the juice of colored grapes in the presence of their skins, and contains from 10 to 12 per cent. of absolute alcohol. It is somewhat astringent.

How is alcohol administered?

Wines may be given pure or mixed with water. Brandy and whiskey are given pure or diluted with water, especially when administered as cardiac stimulants, or in the form of milk punch or egg-nog, when used as a food to support the system.

They may also be injected per rectum, and, if cardiac failure is imminent, brandy may be used hypodermically.

ÆTHER—ETHER.

Is this substance ever used as a cardiac stimulant?

The use of *ether* as a cardiac stimulant has already been mentioned. It acts rapidly, but transiently, and may be used internally, or better still, hypodermically in cases of sudden cardiac failure.

AMMONIUM.

What are the sources of ammonium?

Ammonium is abundantly present in nature as the result of animal and vegetable decay, but is chiefly obtained for commercial purposes from the ammoniacal liquor of gas works.

What are the general physiological actions of ammonium preparations?

AMMONIA GAS in solution is an irritant. Kept in contact with the skin it reddens and finally vesicates. When the gas is *inhaled* it irritates, producing a sense of suffocation, spasm, and, if continued, inflammation of the air passages. When *injected* into the veins of animals in sufficient quantities, it damages the blood and causes convulsions, rapid respiration and death.

Ammonia temporarily stimulates the accelerator nerves of the *heart*, thus increasing the rapidity of its action. After intravenous injection, the *blood pressure* at first falls, but rapidly rises as the pulse becomes quicker. It aids in maintaining the fluidity of the *blood* by retaining the fibrogenous materials in solution. In toxic amounts, the oxygen-carrying function of the *red corpuscles* is interfered with. Intra-venous injections of ammonia quicken *respiration* by powerfully stimulating the respiratory centres. The convulsions are due to stimulation of the *motor and reflex spinal centres.* It is *eliminated* chiefly by the urine as nitric acid and, perhaps, as urea. Its salts are also eliminated by the broncho-pulmonary mucous membrane. When taken internally in medicinal doses it is antacid and carminative, but if continued for too long a period, it disorders digestion and causes emaciation.

What are the symptoms and treatment of poisoning by ammonia?

When a strong solution is swallowed it causes inflammation of the lips, mouth, fauces, pharynx, œsophagus and stomach. Œdema of the glottis may occur, and secondary strictures of the œsophagus or even of the pylorus may result. Death may be due to asphyxia or to collapse preceded by symptoms of corrosive poisoning. The *treatment* consists in neutralizing the alkali by vegetable acids (vinegar); protecting the injured surfaces by oils and demulcents and the occasional passage of an œsophageal bougie, for at least a year, to prevent secondary stricture. The occurrence of œdema of the glottis demands immediate trachcotomy.

What are the therapeutical uses of the ammonium preparations?

Ammonia is a rapid and powerful *cardiac stimulant*, but its effects are of brief duration. It is used for this purpose both internally and by inhalation in all cases of acute *cardiac failure*, and may be used to antagonize the action of *snake poison* and *prussic acid* on the heart, but should here be employed as an adjuvant to alcohol.

For *sudden cardiac failure* during *anæsthesia* or from *surgical shock* it may be given hypodermically.

It has been used by intra-venous injection to *maintain the fluidity of the blood* in cases of threatened *cardiac thrombosis;* and as a *stimulating expectorant* in *pneumonia*, especially when typhoid symptoms are present. It is given *as an alkali* in *acidity*, *flatulence* and in *nervous headache.*

Externally it is an ingredient of stimulating and irritating liniments and may be used as a vesicant.

What preparations of ammonium are used as cardiac stimulants?

AQUA AMMONIÆ FORTIOR (*stronger water of ammonia*) contains 28 per cent. by weight of gaseous ammonia. It is a powerful corrosive poison. It is best adapted for hypodermic use in doses of ♏x–xxv, diluted with four times its volume of water, and repeated in 15 minutes if necessary, and may be used externally as a rapid (but painful) vesicant by inverting a watch crystal full of it on the skin.

AQUA AMMONIÆ (*water of ammonia*) contains 10 per cent. by weight of ammonia-gas; *dose* for internal use, gtt. x–xxx, freely diluted.

Spiritus Ammoniæ (*spirit of ammonia*) contains 10 per cent. by weight of the gas in solution in alcohol; dose ♏x–xxx, freely diluted.

Spiritus Ammoniæ Aromaticus (*aromatic spirit of ammonia*) contains also ammonium carbonate and aromatics; dose fʒss–j, freely diluted.

Ammonii Carbonas (*ammonium carbonate*) is used as a cardiac stimulant, and also in threatened thrombosis. It is very valuable as a stimulating expectorant in capillary bronchitis, typhoid pneumonia, and other low forms of chronic pulmonary disease where an expectorant is required. Dose gr. v–x.

The *iodide*, *phosphate*, *bromide* and the *acetate*, *sulphate*, *tartrate*, and *citrate of iron and ammonia*, and *valerianate of ammonium* have already been noticed; the *acetate*, *benzoate* and *chloride* will be discussed hereafter. The *sulphate* and *nitrate of ammonium* are only used in making other officinal preparations.

ATROPINÆ—ATROPINE.

Is atropine used as a cardiac stimulant?

Atropine (*vid. belladonna*, p. 98) is used as a cardiac stimulant in cases of sudden or threatened heart failure. Dose $\frac{1}{120}$–$\frac{1}{60}$, given hypodermically.

DIGITALIS.

What is digitalis?

Digitalis is the *leaves* of D. purpurea, or purple foxglove (*Nat. Ord.* Scrophulariaceæ), obtained *from plants of the second year's growth.* It is a European plant, cultivated in this country.

What are its chemical constituents?

The knowledge of the chemistry of digitalis is in a very confused state. It is said to contain several glucosides, called *digitalin*, *digitoxin* and *digitalein*, which are supposed to possess identical properties with those of the crude drug, and *digitonin*, which is said to resemble saponin in its effects.

What are the physiological effects of digitalis?

Its effects are much more slowly produced, but are much more lasting than those of the medicines previously considered, and it is therefore more of a tonic than a stimulant to the heart. In *moderate* *doses* it slows and strengthens the cardiac beat, elevates the blood pressure and causes diuresis. It sometimes interferes with the appetite and digestion. After very *large doses*, or when too long continued, nausea and vomiting may occur; the pulse becomes dicrotic, weak, and sometimes rapid, and diaphoresis more or less profuse takes place. *Toxic doses* cause the same symptoms, and in addition vertigo, disordered vision, lowered reflexes, muscular tremors, lassitude, reduced temperature, delirium, stupor, usually convulsions, and death from cardiac paralysis.

In moderate doses it stimulates the peripheral cardio-inhibitory fibres of the vagi (thus slowing the *heart* by increasing the length of the diastole), the cardiac muscle and its contained motor ganglia (thus increasing the strength and force of the systole), and the vaso-motor centres (thus raising the arterial tension). It also acts directly on the muscular walls of the vessels, and thus lessens their calibre.

When full medicinal doses are taken, or when the pulse has been greatly slowed by it, a sudden change from the recumbent to the erect posture may give rise to a small, weak, rapid pulse, with lowered arterial tension.

When *fatal doses* are taken the heart is arrested in systole.

In poisonous doses it lowers *reflex action* by stimulating Setschenow's inhibitory reflex centres and, later, by paralyzing directly the spinal cord. It also lowers the contractility of *muscles*. It usually proves *diuretic*, probably from elevating the arterial tension. It is *eliminated* chiefly by the urine.

How should poisoning by digitalis be treated?

(1) Give emetics and cathartics to remove the poison from the alimentary canal; (2) tannic acid as a chemical antidote; alcohol, ammonium carbonate and opium, or saponin, as physiological antagonists.

What are the medicinal uses of digitalis?

As a *cardiac tonic* digitalis is used in all cases of loss of cardiac power, as in *dilatation* or in *weakness of the cardiac muscle*. *It should never be prescribed* in simple hypertrophy, nor when hypertrophy is sufficient to compensate for valvular lesion. In advanced cases of fatty heart, it should be used very cautiously, if at all, as the increased systolic power which it induces may lead to rupture of the friable cardiac walls. In *valvular diseases*, when the hypertrophy is not compensatory, or when dilatation is taking place, it is invaluable. In "*irritable heart*," *functional palpitation* and *venous engorgements* (by lengthening the diastole it allows the veins more time to empty their contents into the auricles), it is much used. The tincture (♏x–xx) may be employed hypodermically in cases of *sudden cardiac failure.* To sustain the action of a depressed heart in various acute diseases, particularly in *pneumonia*, it is often administered.

In *delirium tremens*, where the pulse is soft and compressible, digitalis is often given in large doses with benefit.

It is also used as a *physiological antidote* to poisoning by *aconite*, *delphinine* and *muscarine*, all of which arrest the heart in diastole.

To *contract the blood vessels* it has been used in *acute inflammations* and in *hemorrhages*, and as it is supposed to stimulate involuntary muscle-fibres generally, it is given in *menorrhagia* and in *spermatorrhœa.*

As a *cardiac tonic* and *diuretic* it is used in all forms of *cardiac* and of *renal dropsy*, in acute *suppression of urine* and in *acute desquamative nephritis.*

What are the preparations of digitalis, and how are they administered?

Digitalis leaves are sometimes given in powder or pill, dose gr. j, t. d., gradually increased. The officinal preparations are—

ABSTRACTUM DIGITALIS (*abstract of digitalis*), dose gr. ss.

EXTRACTUM DIGITALIS (*extract of digitalis*), dose gr. ¼, gradually increased.

EXTRACTUM DIGITALIS FLUIDUM (*fluid extract of digitalis*), dose ♏j.

TINCTURA DIGITALIS (*tincture of digitalis*), dose ♏v–x, gradually increased.

INFUSUM DIGITALIS (*infusion of digitalis*), one of the best preparations, dose fʒss–iv.

Occasionally after digitalis has been taken for some time continuously, especially when free diuresis has not taken place, its action becomes suddenly manifested by the pulse supervention of other effects characteristic of the drug. This is probably due to some delay in the absorption or elimination of the medicine, and when it occurs the remedy should be promptly discontinued.

CAFFEINA—CAFFEINE.

What is caffeine?

Caffeine is a feebly alkaloidal substance generally prepared from the *dried leaves* of Camellia Thea or tea plant (*Nat. Ord.* Ternstræmiaceæ), from the *dried seeds* of Coffea arabica or coffee plant (*Nat. Ord.* Rubiaceæ), or from *guarana* (a paste prepared from the crushed or ground seeds of Paullinia sorbilis (*Nat. Ord.* Sapindaceæ). Guarana is officinal.)

What are its physiological actions?

In *medicinal doses*, caffeine is a cerebral stimulant, causing nervous restlessness, increased mental activity and wakefulness; it also increases the cardiac force, raises the arterial pressure, and acts as a decided diuretic. After *poisonous amounts*, there is also confusion of thought, with delirium, muscular tremblings, cardiac oppression, quickened respiration, cold extremities, symptoms of collapse, rise of temperature, and (in animals) tonic and clonic convulsions, muscular weakness, general paresis, and death from paralysis of respiration.

It increases the power of the *heart* and raises *arterial tension*, probably by a direct stimulant effect upon the heart muscle. It is *diuretic*, not only indirectly by increasing the blood pressure, but also by some direct action on the kidney itself. The *convulsions* are probably due to spinal stimulation. In moderate doses, caffeine is said to be entirely destroyed in the system; in toxic doses, it is partly destroyed and partly eliminated by the kidneys. Its effect on the elimination of waste products is at present uncertain.

What are its medicinal uses?

As a *cardiac tonic* (more rapid in action, but not so enduring as digitalis), it is used to meet the same indications which call for the use of digitalis. In cases of *sudden heart failure*, it may be used hypodermically combined with equal parts of sodium salicylate, which renders it more soluble in water.

As a combined *cardiac stimulant* and *diuretic* it is very useful in the latter stages of *chronic Bright's disease* with weak heart.

As a *diuretic* in all *renal* and *cardiac dropsies* it is very serviceable. It is also employed as a *cerebral stimulant* in nervous and neuralgic *headaches*, and combined with other antagonists in opium poisoning.

How is caffeine administered?

CAFFEINA (*Caffeine*) may be given in pill, capsule or solution, dose gr. j–v, or more. For administration in fluid form *caffeine citrate* (so-called) is preferred as more soluble.

When given as a *cerebral stimulant*, one dose of gr. ij–v is usually sufficient, but as a *cardiac tonic* and *diuretic* this dose should be repeated twice daily, and gradually increased if necessary up to gr. x–xij.

GUARANA (*Guarana*) contains *tannic acid* as well as *caffeine* in considerable quantities, and is principally used in *neuralgic* and in *sick-headache*. In Brazil, whence it comes, it is also used as an astringent in diarrhœal affections, dose ʒj.

EXTRACTUM GUARANÆ FLUIDUM (*fluid extract of guarana*), dose ♏x–xx.

ADONIDIN.

What is adonidin?

Adonidin (not officinal) is a glucoside, obtained from the root of Adonis vernalis (*Nat. Ord.* Ranunculaceæ), a plant of northern and central Europe.

What are its effects, uses and modes of administration?

The *effects* of adonidin are almost identical with those of digitalis (but are much more quickly produced), as it stimulates the cardiac muscle and contained motor ganglia, thus increasing the force of the cardiac contractions at the same time that, by stimulating the inhibitory fibres of the vagi, it increases the length of the diastole and thus slows the heart. The arterial tension is also elevated, probably by stimulation of the vaso-motor centres. In large doses it paralyzes both the heart and vessels, the arterial tension falls and the heart is finally arrested in diastole. It sometimes (not as frequently as does digitalis) causes nausea, vomiting and diarrhœa. It sometimes proves diuretic. It is *used* as a *card*
class of diseases in which digitalis is emplo
tuted for it where the latter disagrees or is

It may be alternated with digitalis for a few weeks during a course of the latter. Dose gr. $\frac{1}{8}$–$\frac{1}{2}$ every 3 or 4 hours, in pill or capsule.

STROPHANTUS.

What is strophantus?

Strophantus (not officinal) is the *seed* of S. hispidus (*Nat. Ord.* Apocynaceæ), an African plant which has been used by the natives as an arrow-poison, and called by them Kombé or Ineé. It contains a crystalline glucoside, called *strophantin*

What are its effects, uses and modes of administration?

The effects of *strophantus* are more rapid in action, but much more evanescent, than those of digitalis. It appears to act upon the muscles directly, and to have little or no effect upon the nervous system.

In *moderate doses* it greatly increases the strength of the cardiac systole, prolongs the diastole and increases the arterial tension probably by acting on the muscular walls of the vessels. In *large doses* it increases the contractibility of all the striated muscles and finally arrests the heart in systole.

It proves diuretic by increasing the arterial tension, and has no cumulative effects. It is *used* as a substitute for digitalis in *cardiac diseases* when a temporary effect or a temporary change of medicines is desirable. From its *diuretic* action it has been successfully employed in various forms of *œdema* depending on a weak circulation and general *cardiac and renal dropsies.* A *tincture* (1 to 20 parts by weight) is used; dose ♏j-x, t. d.; or *strophantin* may be cautiously administered hypodermically; dose gr. $\frac{1}{100}$–$\frac{1}{60}$.

SPARTEINE.

What is sparteine?

Sparteine (not officinal) is a *liquid alkaloid* obtained from Sarothamnus Scoparius, or broom (*Nat. Ord.* Leguminosæ).

What are its effects and uses, and how is it administered?

Sparteine is a cardiac tonic, in *moderate doses* increasing the force and persistence of the cardiac contractions by direct action upon the heart or its contained motor ganglia and, at first increasing its frequency by, paralyzing the vagi, afterward decreasing the pulse-rate by its direct action on the heart. When the cardiac rhythm is disturbed it renders its contractions regular. In *large doses* it depresses the heart and causes death from paralysis of the respiratory centre. It depresses the cerebral and spinal centres. It has no diuretic properties. It has been *used* as a substitute for digitalis in *cardiac diseases*, and in cases of feebleness and irregularity of cardiac action. It is inferior to digitalis as a cardiac tonic, but may be used as a succedaneum to it. It is usually administered in the form of *sulphate*, of which the dose is gr. $\frac{1}{20}$–$\frac{1}{4}$ hypodermically; or if given internally, gr. $\frac{1}{4}$–j or ij, in capsule or pill.

STRYCHNINA—STRYCHNINE.

Is strychnine prescribed for its cardiac effects?

The use of strychnine as a cardiac tonic has been noticed under the head of nux vomica (*q. v.*); dose gr. $\frac{1}{30}$–$\frac{1}{20}$ internally, or gr. $\frac{1}{60}$ if used hypodermically.

CIMICIFUGA.

What is cimicifuga?

Cimicifuga is the *rhizome* and *rootlets* of C. racemosa, black snakeroot or cohosh (*Nat. Ord.* Ranunculaceæ), a common indigenous plant. It contains a *volatile oil*, to which its virtues are probably due. Its *effects* on the circulation are supposed to resemble those of digitalis, while it acts on involuntary muscular fibres similarly to ergot. Recently it has been said, however, that it is a direct depressant to the cardiac muscle or its ganglia. It depresses the reflexes and occasionally causes nausea and vomiting. Its action is mild and not well understood. It is also diuretic and expectorant. It has been *used* as a *cardiac tonic* in fatty heart, as a *diaphoretic* in *rheumatism*, as a *diuretic* in *dropsies*, as an expectorant in *chronic bronchitis*, and as an *antispasmodic* in *chorea*, in which disease it is sometimes of value, combined with tonics and laxatives. It is not often prescribed.

EXTRACTUM CIMICIFUGÆ FLUIDUM (*fluid extract of cimicifuga*), dose fʒss–j.

TINCTURA CIMICIFUGÆ (*tincture of cimicifuga*), dose fʒss–ij.

ORDER II.—CARDIAC SEDATIVES.

What are cardiac sedatives?

Cardiac sedatives are medicines which are used to diminish the force and frequency of the cardiac contractions when they are morbidly increased, and thus to depress the circulation.

Name the principal cardiac sedatives.

Antimonials, aconite and its alkaloid, veratrum viride and its alkaloids, veratrine, gelsemium, pulsatilla, arnica, the vegetable acids.

ANTIMONIUM—ANTIMONY.

What are the sources of antimony?

Antimony is a metallic element found native in the form of black antimonious sulphide.

Mention some of the tests for antimony.

Sulphuretted hydrogen in solution forms with solutions of antimonial salts an orange-colored precipitate. The metal should also be reduced by Marsh's test, and chemically and microscopically distinguished from arsenic.

What are the general physiological effects of antimonials?

When applied *locally* to the skin, the salts of antimony produce an eruption of papules, which become pustules, somewhat resembling the eruption of smallpox. After prolonged use, the fauces sometimes present a similar eruption. *Internally*, in *small doses*, they are diaphoretic. In somewhat *larger doses*, they cause nausea, depressed circulation, weakness, and increase of the mucous and cutaneous secretions. In *large doses*, they prove emetic, with very weak pulse, great general depression and relaxation of the muscular system. In *poisonous doses*, they are gastro-intestinal irritants, causing emesis, catharsis with cramps in the extremities, and collapse, often resembling Asiatic cholera, and death from asthenia, sometimes preceded by tonic and clonic spasms.

Antimonials slow the *heart*, increase the duration of its diastole and diminish the force of its systole by direct depression of the cardiac functions; they lower the blood pressure partly by cardiac depression and partly by paralyzing the peripheral vaso-motor system. The pulse finally becomes rapid and very feeble, the pressure sinks almost to *nil* and the heart is arrested in diastole. They depress and paralyze the reflex, sensory, and, to a less extent, the motor functions of the *spinal cord.* The *temperature* is reduced by poisonous doses. The *emesis* is probably partly from local and partly from centric irritation.

When *given for a length of time*, they cause fatty degeneration of various viscera.

Antimony is *eliminated* by the mucous membranes, especially of the stomach, by the liver, kidneys and skin.

What is the treatment of poisoning by antimony?

Wash out the stomach to remove any poison present; give tannic acid as a chemical antidote, and opium and stimulants to overcome the resulting depression.

What are the medicinal uses of antimonials?

They are used as *cardiac sedatives* in the early stages of *acute sthenic inflammations*, but are probably inferior to aconite or veratrum viride for this purpose. They are very useful in the early stages of *acute bronchitis* and in *acute laryngitis* from their combined sedative, diaphoretic and expectorant qualities. As *diaphoretics* they are used in minute doses, frequently repeated, in fever mixtures, or combined with minute amounts of morphine, which increases their action. The depression which they produce should always be remembered.

As *nauseants* and *emetics* they are rarely resorted to, because of the great depression which they produce.

Sulphurated antimony, or the old Kermes mineral, is sometimes used as a nauseant in membranous croup.

Locally, as a *counter-irritant* it is rarely employed.

What are the antimonial preparations?

ANTIMONII ET POTASSII TARTRAS (*antimonium and potassium tartrate—tartar emetic—tartarized antimony*); dose, *as a sedative*, gr. $\frac{1}{4}$–$\frac{1}{2}$, increased to gr. j–ij, as tolerance to its action is established; as *a diaphoretic* and *expectorant*, gr. $\frac{1}{16}$–$\frac{1}{4}$ in solution, repeated every 2 or 3 hours until the desired results are produced; as an *emetic*, gr. j–ij.

VINUM ANTIMONII (*wine of antimony*) contains 4 parts of tartar emetic in 1000 of the preparation (about gr. ij–f℥j). Dose as a *diaphoretic* and *expectorant* ♏x–xxx; as an *emetic* fʒj–iv.

Syrupus Scillæ Compositus (*compound syrup of squill*) contains tartar emetic gr. j to the f℥j. It is used in croup as an *emetic* and also as an *expectorant*; dose ♏v–fʒj.

The following preparations are somewhat uncertain, and are rarely employed:—

Antimonii Oxidum (*antimonious oxide*), dose gr. j–ij.

Pulvis Antimonialis (*antimonial powder—James' powder*) contains antimonious oxide 33 per cent. with precipitated calcium phosphate, dose gr. iij–x.

Antimonii Sulphidum (*antimonious sulphide*) and Antimonii Sulphidum Purificatum (*purified antimonious sulphide*) are used in making the other preparations.

Antimonii Sulphuratum (*sulphurated antimony*), dose gr. j–iij; as an *emetic* gr. v–x.

Pilulæ Antimonii Compositæ (*compound pills of antimony*). Used as an alterative. One pill contains of calomel and sulphurated antimony each gr. ss.

ACONITUM—ACONITE.

What is aconite, and what is its chemical composition?

Aconite is the *tuberous root* of Aconitum Napellus, aconite, monkshood or wolfsbane (*Nat. Ord.* Ranunculaceæ), a native of the mountains of Europe and Asia. The active principle is an alkaloid called *aconitine*. Other alkaloids have been discovered in it, viz.: *pseudaconitine*, *aconine*, *pseudaconine*, and *picraconitine*.

What are its physiological effects?

Locally applied, aconite or aconitine benumbs the sensory nerves and causes a sensation of tingling. *Internally* in *small doses* it lessens the force and frequency of the cardiac contractions, diminishes the blood pressure, causes tingling in the lips, tongue and extremities and produces a feeling of weakness. When *large doses* are taken, these symptoms are more marked, the pulse becomes very weak and slow, a tendency to fainting is manifested on assuming the erect posture or on any exertion, and the respirations are reduced in number. After *poisonous* doses these symptoms are much intensified; the countenance is anxious, a cold sweat covers the body, the pulse and respiration are very slow, weak and irregular, general anæsthesia is present, and collapse and death from syncope, sometimes preceded by convulsions, occur.

Aconite affects the *heart* by directly depressing the cardiac muscle, and its contained motor ganglia. It probably also stimulates the cardio-inhibitory apparatus, but does not affect the vaso-motor nerves or centres. It paralyzes the peripheral end organs of both *motor* and *sensory nerves*, the latter being first affected by it, and the nerve trunks and centres being only involved as the poisoning deepens. The loss of reflex function is probably due to interference with conduction. It depresses and finally paralyzes the *respiratory centre.*

What is the treatment of poisoning by aconite?

Evacuate the contents of the stomach and wash it out by means of the stomach pump; keep the sufferer perfectly quiet, with his head low; give cardiac stimulants, as alcohol, ether or ammonia, and administer digitalis hypodermically.

What are the medicinal uses of aconite?

As a *cardiac sedative* aconite is of great value in the early stages of all *acute inflammations* and all *fevers*, in which the patient is vigorous and young and the pulse tense, full, bounding and strong, and is only *contraindicated* when the heart is weak, when there is gastro-enteric inflammation, or where a typhoid condition is present. Thus it is used to diminish the circulation, arterial tension and temperature, and to promote diaphoresis and diuresis in the sthenic forms of *surgical fever*, in *acute coryza*, acute *broncho-pulmonary* catarrhs, *acute pleuritis* and *acute peritonitis*, in *acute meningitis* either cerebral or spinal, and in the *essential fevers*, when not of the asthenic type. In *scarlet fever* and in *measles* (when the temperature is high), it is of great value, and is often used during the exacerbations of remittent malarial fevers. In *lobar pneumonia* veratrum viride is a safer remedy, but aconite will prove very serviceable if employed with great caution before consolidation has taken place.

In *cardiac hypertrophy* uncomplicated by valvular lesion, or even if the latter is present, provided the hypertrophy be in excess of the requirements of the system, it is an invaluable medicine.

As a *local anæsthetic* it has been advantageously given internally and applied externally in *neuralgia*, particularly of the face and head, and has been used locally in *chronic muscular rheumatism* and in *rheumatic neuralgiæ.*

What are the preparations of aconite and their doses?

ABSTRACTUM ACONITI (*abstract of aconite*), dose gr. ss–j.

EXTRACTUM ACONITI (*extract of aconite*), dose gr. $\frac{1}{8}$–ss.

EXTRACTUM ACONITI FLUIDUM (*fluid extract of aconite*), dose ♏ ss–ij.

TINCTURA ACONITI (*tincture of aconite*), dose ♏ j–v, frequently combined with other medicines in fever mixtures.

In fevers and inflammations aconite is preferably given in small doses, repeated every few hours, and carefully watched, until its effects on the pulse are obtained.

Aconitine is not officinal and should not be used internally, as even in the minutest doses it is a powerful poison. Duquesnel's aconitine has, however, been administered with great care in *tic douloureux* with success. Dose gr. $\frac{1}{300}$–$\frac{1}{200}$. Morson's aconite is probably even more powerful. Aconitine is used *locally* as an anodyne in neuralgia, in the form of liniment (gr. ij–f℥j) or as an addendum to ointments.

VERATRUM VIRIDE.

What is veratrum viride, and what does it contain?

It is the *rhizome and rootlets* of Veratrum viride, American or swamp hellebore or Indian poke (*Nat. Ord.* Melanthaceæ), a plant indigenous to swampy places in the eastern part of the United States. It contains two alkaloids, *veratroidine* and *jervine*, to which its effects are due; also *rubijervine*, *pseudojervine*, resin, etc.

What are their physiological effects?

Jervine taken *internally* causes great weakness, depresses the spinal cord and lowers reflex action, lessens the force and frequency of the heart by direct action on the cardiac muscle or its contained motor ganglia, greatly reduces the blood pressure, both by its action on the heart and by depressing and finally paralyzing the vaso-motor centres, causes profuse salivation, and death from asphyxia, preceded by convulsions of cerebral origin.

Veratroidine gives rise to the same general effects, but in addition always produces vomiting and often purging. When directly applied to the heart muscle, it paralyzes it. Given internally, it first slows the heart and lowers the blood pressure by stimulating the vagus, then, the pulse remaining slow, the heart-beats increase in force and the blood pressure rises to normal, but suddenly, from peripheral paralysis of the vagi, the cardiac action becomes very rapid and diminishes in force, and, as asphyxia increases, the arterial tension is much elevated. Death is due to paralysis of the respiratory muscles.

Veratrum viride combines the effects of its alkaloids, and is a powerful arterial and spinal depressant, diminishing the frequency and force of the cardiac contractions, by depressing the heart muscle and stimulating inhibition, and lowering the blood pressure by paralyzing the vaso-motor system. It often causes vomiting. It is a diaphoretic, reduces the temperature, and sometimes proves diuretic. Poisoning rarely occurs, as an overdose causes emesis. Should dangerous symptoms arise, they should be treated with alcoholic and other cardiac stimulants.

What are the medicinal uses of veratrum viride?

It is given as a *cardiac sedative* in the same *inflammatory* and *cardiac affections* in which aconite is administered, and its *contra-indications* are identical with those of the latter drug, with the addition that in peritonitis it is not a safe remedy, because of its liability to cause vomiting. In *acute lobar pneumonia* it is considered much safer than aconite. In *acute mania* and in *mania-a-potu* (when the patient is strong and the pulse full and bounding), it is a valuable medicine, but should never be given in delirium tremens. It has been recommended in *puerperal eclampsia*, partly as an arterial sedative and partly as a reflex depressant.

What are its preparations and their doses?

Extractum Veratri Viridis Fluidum (*fluid extract of veratrum viride*), dose ♏j–iv.

Tinctura Veratri Viridis (*tincture of veratrum viride*), ♏ij–x.

Its effects are better obtained by giving small and increasing doses at intervals of an hour, being careful not to cause vomiting, and closely watching the pulse.

VERATRINA—VERATRINE.

What is veratrine?

Veratrine is an *alkaloid* or *mixture of alkaloids* obtained from the seeds of Asagræa officinalis (*Nat. Ord.* Melanthaceæ), a Mexican plant.

How may its presence be detected?

When warmed in concentrated hydrochloric acid, a persistent dark-red color is produced, resembling a strong solution of potassium permanganate. This is Trapp's test for veratrine.

What are its physiological actions?

Locally veratrine is irritant, causing heat and pain, followed by numbness, and if long applied, redness of the surface. After *small doses* the pulse is weakened and reduced in frequency. *Large doses* are followed by vomiting and purging and muscular weakness; with cold, clammy skin; weak, rapid, irregular pulse and muscular tremors. Veratrine appears to stimulate the excito-motor *cardiac ganglia and muscle* (temporarily increasing the pulse), but soon depresses, and finally paralyzes them. It excites and then destroys the function of the vagi (thus lessening the pulse-rate, which, however, in poisoning, become rapid again as the vagi are paralyzed). The *vaso-motor centres* are first stimulated, then depressed. It first stimulates and then depresses the nerve trunks (or their peripheral end-organs) and the muscles, without apparently affecting the cerebrum or spinal cord. It depresses and finally paralyzes the respiratory centre, death occurring from this cause. The temperature is also lowered. It is eliminated chiefly by the skin and kidneys, increasing their secretion.

No fatal case of poisoning is recorded; the treatment is the same as that employed in poisoning by veratrum viride.

What are its therapeutic uses and preparations?

Although it has been used as a cardiac depressant, yet as it is inferior in this respect to the remedies already considered, it is now but little given *internally*. It is chiefly used as an external application in *rheumatic pains* and in *neuralgia*.

UNGUENTUM VERATRINÆ (*ointment of veratrine*) contains 1 part of veratrine in 26.5 parts of the preparation.

OLEATUM VERATRINÆ (*oleate of veratrine*) contains 2 per cent. of the alkaloid.

GELSEMIUM.

Is gelsemium used as a cardiac sedative?

It has been employed for this purpose in sthenic inflammation and fevers. Its medicinal uses have been described among the depresso-motors.

PULSATILLA.

What is pulsatilla?

It is the *herb* of Anemone pulsatilla and other species of anemone (*Nat. Ord.* Ranunculaceæ), and contains a volatile oily substance which, when kept, decomposes, forming *anemonin* and *anemonic acid.*

What are its effects and uses?

Locally pulsatilla is irritant; *internally* it depresses the circulation and lowers the blood-pressure, and in poisonous doses causes vomiting and purging, dilated pupils, convulsions, paralysis, diminished sensation, coma and death. It is *eliminated* by the kidneys. Pulsatilla is not much *used*, as it is decidedly inferior to other cardiac sedatives. It may be given in *doses* of gr. j–v in powder, pill, capsule or infusion, or a tincture or fluid extract may be prepared.

ARNICA.

What is arnica?

It is the *flower-heads* and the *rhizome and rootlets* of Arnica montana, leopard's bane (*Nat. Ord.* Compositæ). It contains *arnicin*, a *volatile oil*, *resins*, etc.

What are its effects and uses?

Locally applied arnica is a stimulant and often a decided irritant. *Internally* it slows the heart, but seems to raise the arterial pressure slightly. In large doses it is emetic and cathartic, causes great muscular weakness, a rapid pulse, and if the dose be excessive, collapse. It seems to be eliminated by the skin and kidneys. Arnica is not much *used* in this country except as an *external* application to sprains and contusions. When thus employed its irritant qualities should be borne in mind. The preparations are:—

EXTRACTUM ARNICÆ RADICIS (*extract of arnica root*), dose gr. v–x.

EXTRACTUM ARNICÆ RADICIS FLUIDUM (*fluid extract of arnica root*), dose ♏x–xx.

TINCTURA ARNICÆ RADICIS (*tincture of arnica root*) and TINCTURA ARNICÆ FLORUM (*tincture of arnica flowers*), dose ♏x–xxx.

EMPLASTRUM ARNICÆ (*plaster of arnica*).

THE VEGETABLE ACIDS.

Name the vegetable acids.

The officinal vegetable acids are: acetic, citric and tartaric acids.

What are their general effects and uses?

When applied to an abraded surface they are irritant (tartaric acid being most, and citric the least, powerful). Given *internally* they increase the saliva and thus diminish thirst in fever. In *large doses* they are gastro-intestinal irritants and cardiac sedatives. They are probably oxidized in the blood and converted into carbonic acid, which by abstracting part of the base of the alkaline phosphates, converts them into acid phosphates, thus increasing the acidity of the urine. When taken in large quantities they cause flatulence, tormina and diarrhœa. Their long-continued use disorders the digestion, and causes emaciation and an anæmic condition. They are eliminated, chiefly as carbonates, by the intestines and kidneys.

The vegetable acids are *used* as *refrigerants* and perhaps cardiac sedatives in *fevers* (citric acid), as *antiscorbutic agents* (citric or acetic acid), in *acute rheumatism* (lemon juice is, however, inferior to the alkaline treatment), in *indigestion* depending on superacidity of gastric juice (lemon juice before meals), and as *diuretic* to increase the amount of urine, and render it acid in reaction (tartaric or citric acid).

They are also used as *chemical antidotes* to poisoning by the alkalies.

Locally acetic acid is used as a *caustic* to remove corns and warts, as a stimulating liniment in *sprains*, as an injection in *vaginal leucorrhœa*, and diluted with water it is given per rectum to *destroy ascarides*, and as a cooling lotion in fevers. The preparations are—

ACIDUM ACETICUM GLACIALE (*glacial acetic acid*) and ACIDUM

ACETICUM (*acetic acid*); are used externally as caustics. The latter contains 36 per cent. of the glacial or absolute acid.

ACIDUM ACETICUM DILUTUM (*diluted acetic acid*) may be used internally; dose f℥j–ij diluted. It is a pure form of vinegar.

ACIDUM CITRICUM (*citric acid*), ℥j to water Oj, may be used as a substitute for lemonade.

SYRUPUS ACIDI CITRICI (*syrup of citric acid*) contains 8 parts of the acid in the 1000 of the preparation.

LIMONIS SUCCUS (*lemon-juice*), SYRUPUS LIMONIS (*lemon-syrup*), OLEUM LIMONIS (*oil of lemon*), and SPIRITUS LIMONIS (*spirit of lemon—essence of lemon*) are also officinal.

ACIDUM TARTARICUM (*tartaric acid*) is rarely used in medicine, except as an ingredient of Seidlitz powders.

(C) ON THE SEXUAL ORGANS.

ORDER I.—APHRODISIACS.

What are aphrodisiacs?

Aphrodisiacs are medicines used to excite the functions of the genital organs when they are morbidly depressed.

What medicines are used for this purpose?

When the *nutritive functions are not properly performed*, the tonics or alteratives, especially phosphorus, zinc phosphide, the phosphates and hypophosphites, the salts of iron, gold or arsenic, and cod-liver oil are used. When there is *an absence of sexual desire*, small doses of opium, very minute amounts of alcohol, cannabis Indica, musk, or small doses of camphor may be useful by stimulating the cerebral centres. If impotence be due to *want of erectile power*, the tonics and alteratives are of use, as are also agents acting on the genital centre in the lumbar portion of the spinal cord and agents which either determine a flow of blood to the part by increasing the general or local circulation or which, by contracting the veins, aid in producing and maintaining erection. Thus, nux vomica or its alkaloid, the cardiac stimulants, hamamelis, ergot, cantharides and myrrh are useful in this condition. Good hygiene, cold baths, proper food and sea air and bathing, electricity, and moral means are important. The above medicines have either been considered already or will be found in their appropriate places.

ORDER II.—ANAPHRODISIACS.

What are anaphrodisiacs?

Anaphrodisiacs are medicines which are used to depress the sexual functions when they are morbidly excited.

What medicines are employed for this purpose?

Morbid excitation of the sexual organs is treated by medicines which depress the functions of the body generally, as nauseants and purgatives, or those which, by depressing the brain or spinal cord, will prove sedative to centres governing these organs: thus full doses of opium or of camphor will depress the cerebral centre, while potassium or ammonium bromide (very useful), monobromated camphor, iodine and the iodides, potassium nitrate, ammonium chloride, belladonna, tobacco, and conium act more especially on the spinal centre and nerves. Medicines diminishing the circulation of the parts will also prove advantageous, as the cardiac sedatives or full doses of digitalis and the bromides. Cocaine locally applied acts by contracting the vessels and diminishing the secretions of the sensory nerves.

Other agents used for this purpose are the local use of cold, general blood-letting, a low diet, avoidance of stimulation, and the withdrawal of blood to other parts of the body, as by hard mental work or exercise with the upper extremities.

ORDER III.—OXYTOCICS.

What are oxytocics?

Oxytocics are medicines which are employed to increase the power of a contracting uterus, thus aiding in the expulsion of its contents.

Name the medicines belonging to this order.

Ergot; ustilago; gossypii radicis cortex, and quinine.

ERGOTA—ERGOT.

X **What is ergot?**

Ergot is the *sclerotium* of Claviceps purpurea (*Nat. Ord.* Fungi), replacing the grain of Secale cereale (*Nat. Ord.* Graminaceæ), or, in other words, it is a fungus growing from the diseased ovary of rye.

What does it contain?

The exact chemical composition of ergot is still a matter of doubt, but the latest researches seem to show that it contains a resinoid substance, *sphacelinic acid*, and a neutral principle, *cornutin*, which together represent the value of the drug.

What are its physiological effects?

The effects of ergot are chiefly manifested on the uterus of the pregnant female and on the circulation. In the *non-pregnant*, *small doses* produce no perceptible effect; *moderate doses* slow the heart, probably by stimulating the peripheral fibres of the vagi, and enormously increase the blood pressure by stimulating the vaso-motor centres. *Large doses* cause nausea and vomiting, increased peristalsis and purging. *Toxic doses* depress the heart by acting directly on its muscle or coating ganglia, and lower the blood pressure, partly by its action on the heart and partly from depression of the vaso-motor centres.

When *poisonous doses are given to animals*, there is salivation, vomiting and sometimes diarrhœa, rapid pulse and respiration, dilated pupil, trembling, great thirst, prostration, paraplegia, convulsions and death. The nervous symptoms appear to be due to action on the nerve centres.

Ergot possesses the property of causing contraction of all non-striated muscular fibres: thus it contracts the arterioles, increases intestinal peristalsis, and increases the power as well as the duration of the uterine contractions during labor, but does not always originate them during pregnancy or at other times, except immediately prior to and after parturition.

What is ergotism?

When ergot is used continuously in large amounts as an article of diet, it produces a condition of chronic poisoning, which manifests itself either by gangrene (usually dry, but occasionally moist and attended with septicæmia) or by tetanic spasms.

What are the medicinal uses of ergot?

Ergot is used *as an oxytocic* in *small doses* in *uterine inertia* during the second stage of labor, when there is no resistance either on the part of the bony canal or the soft parts of the mother. When thus administered, it energizes the uterine contractions, but if given in large doses it renders them tetanic and continuous, thus greatly increasing the danger both to the mother and child.

To prevent *post-partum hemorrhage* by contracting the uterus, and thus compressing the uterine sinuses, it is invaluable, but had better be withheld until the placenta has left the uterine cavity, as prior to this it will tend to imprison the placenta by contracting the cervix. After the uterus is empty, it may be given in full doses, either by the mouth or hypodermically.

It has been used to *induce premature labor*, but is at best an uncertain remedy for this purpose. To arrest hemorrhage in cases of *threatened abortion*, ergot is worse than useless, unless the uterus is emptied. In these cases, by contracting the cervix, it imprisons the ovum, and thus, by preventing its escape, keeps the uterus distended. If given at all in these cases, its administration should be conjoined with the application of vaginal tampons. It is also given to aid the expulsion of *uterine polypi.*

As a hæmostatic, it is used in all *hemorrhages* where surgical means of arrest cannot be employed, and is often given as an adjuvant to their local treatment. In *menorrhagia*, *epistaxis*, *hemorrhage from the gums*, and in *broncho-pulmonary*, *intestinal* or *renal hemorrhage* it is very efficient. In *hæmatemesis*, it is not so serviceable. In *purpura*, it acts beneficially. From its influence in contracting blood vessels, it has been used in the early stages of *pneumonia* and other *inflammatory affections*, in *spinal congestions*, in *cerebro-spinal meningitis*, and for the cure of *internal aneurisms.* It has been injected hypodermically near the seat of disease for the cure of *varices*, *hemorrhoids*, and *impotence* due to dilatation of the dorsal vein of the penis. It may be employed with great advantage, either internally or hypodermically, to reduce the size of an *enlarged spleen.* In *glycosuria* and in *polyuria* it does good, and, from its influence on unstriped muscular fibres generally, it is useful in *relaxation of the sphincters*, *diarrhœa*, *dysentery*, *spermatorrhœa*, *uterine subinvolution*, and to diminish the size of *subperitoneal uterine fibroids.*

What are the preparations of ergot and their doses?

EXTRACTUM ERGOTÆ (*extract of ergot*) is five times as strong as the fluid extract; dose gr. v–xv. It may be used hypodermically, dissolved in water and filtered.

EXTRACTUM ERGOTÆ FLUIDUM (*fluid extract of ergot*), dose ♏v–f℥iv.

VINUM ERGOTÆ (*wine of ergot*) contains 15 per cent. of powdered ergot, dose f℥j–iv.

USTILAGO.

What is ustilago?

Ustilago maydis (*Nat. Ord.* Fungi), corn smut or corn ergot, is a fungoid growth upon Zea mays, or Indian corn (*Nat. Ord.* Graminaceæ). It is believed to possess similar properties, as regards the pregnant uterus, with ergot, but is said never to produce the continuous tetanic contractions which are caused by the latter. It has been used in *uterine inertia* during the second stage of labor. Dose of the *fluid extract* (not officinal) ♏v–f℥j.

GOSSYPII RADICIS CORTEX—BARK OF COTTON ROOT.

What is gossypii radicis cortex?

It is the *bark of the root* of Gossypium herbaceum and other species of Gossypium (*Nat. Ord.* Malvaceæ).

Given to animals, it first slows and then quickens the cardiac action, which is always enfeebled by first stimulating and then paralyzing the cardio-inhibitory apparatus and depressing the cardio-motor ganglia. It stimulates and then depresses the vaso-motor centres, causing a rise, but subsequently a fall, in the blood pressure. It stimulates non-striated muscular fibres, and appears to excite rhythmical contractions of the gravid uterus and to increase their power when present. It depresses the reflex centres of the cord, and causes death by respiratory paralysis, generally preceded by convulsions, which are not of cerebral origin.

It has been *recommended* as a substitute for ergot in *uterine inertia*, *post-partum hemorrhage*, and to aid the expulsion of *uterine myomata*. It has been used in *chronic metritis*, and although not as efficient as ergot, is useful in *menorrhagia*.

EXTRACTUM GOSSYPII RADICIS FLUIDUM (*fluid extract of cotton root*), dose f℥ss–j.

QUININA—QUININE.

7 **Is quinine oxytocic?**

Although quinine is used for this purpose, it probably posseses no action on the uterus *per se*, but as an antiperiodic or as a tonic, is capable of overcoming the morbid conditions (as malaria) which, by depressing the system at large, may prevent normal, healthy uterine contractions.

ORDER IV.—UTERINE SEDATIVES.

What are uterine sedatives?

They are medicines which are employed to depress the uterine muscular or nervous apparatus and restrain violent, irregular or untimely uterine contractions.

What medicines are used for this purpose, and when are they employed?

They are principally useful during pregnancy, to prevent abortion which is threatening, but not inevitable. They are also of service in arresting the irregular uterine contractions which sometimes occur prior to labor, and are called "false labor pains." For the former purpose opium, cannabis indica and the motor depressants—as chloral, the bromides, tartar emetic and viburnum, especially the first- and last-named remedies—are used, while for the latter opium and chloral are employed. To moderate too violent contractions during labor, ether is the best remedy. Of these medicines all have been described except

VIBURNUM.

What is viburnum?

Viburnum is the *bark* of V. prunifolium, sloe or black haw (*Nat. Ord.* Caprifoliaceæ), a small indigenous tree. It *contains valerianic acid*, a bitter principle (*viburnin*), resin, tannin, etc. Its *physiological effects* are not understood. It appears to be a uterine sedative and has been employed for this purpose in *threatened abortion*, *post-partum dolores*, and in congestive and neuralgic *dysmenorrhœa.* It is useful in some cases of *menorrhagia.*

EXTRACTUM VIBURNI FLUIDUM (*fluid extract of viburnum*), dose f℥ss-ij, in elixir of orange.

ORDER V.—EMMENAGOGUES.

What are emmenagogues?

Emmenagogues are medicines employed to increase or reëstablish the menstrual flow when it is scanty or suppressed from other causes than pregnancy or the climacteric period.

When the catamenia are arrested from pregnancy, medicines used to bring them on cannot but be injurious to the woman, as the doses necessary are sufficient to cause poisoning, one of the symptoms of which may (or may not) be uterine hemorrhage. This is especially true of cantharides and of the volatile oils.

What medicines are used as emmenagogues?

When amenorrhœa depends upon anæmia or chlorosis the best emmenagogues are iron (combined with aloes or myrrh), arsenic or manganese. When local anæmia or an atonic condition of the uterus is present, aloes (*q. v.*) is very useful. If, on the other hand, pelvic plethora exists with constipation and a scanty flow often of a thick black discharge accompanied with pelvic pain and fullness, the saline cathartics are employed.

In suppression of the menses from cold, aloes and potassium permanganate are usually more successful. In amenorrhœa due to an atonic condition of the uterus, the more stimulating emmenagogues are given, generally with aloetic purgatives.

STIMULATING EMMENAGOGUES.

Name the stimulating emmenagogues.

Savine, oil of rue, tansy, apiol, cantharides and guaiac.

SABINA—SAVINE.

What is savine?

Savine is the *tops* of Juniperus Sabina (*Nat. Ord.* Coniferæ), a small evergreen shrub of Southern Europe. It contains a *volatile oil.* When applied *locally* savine is irritant. In *medicinal doses* it increases the circulation, is a gastric, uterine and renal irritant, and proves diuretic. In overdoses it is a gastro-intestinal irritant with great depression, unconsciousness, convulsions, hemorrhages from the uterus and kidneys, suppression of urine and, in pregnant females, abortion. Death occurs from collapse. Savine is *used* in relaxed states of the uterus and uterine vessels, and has proved successful in the treatment both of *amenorrhœa* and *menorrhagia* when due to atonic condition of this organ.

EXTRACTUM SABINÆ FLUIDUM (*fluid extract of savine*), dose ♏v–x.

CERATUM SABINÆ (*savine-cerate*), used occasionally as an irritant to prevent healing of blistered surfaces.

OLEUM SABINÆ (*oil of savine*), the best preparation for internal use ; dose gtt. v–x, in capsules or emulsion, every 3 or 4 hours.

OLEUM RUTÆ—OIL OF RUE.

What is the oil of rue?

It is a volatile oil distilled from Ruta graveolens (*Nat. Ord.* Rutaceæ). Its *effects* are similar to but less powerful than those of savine. It is *used* in atonic *amenorrhœa* as a uterine stimulant, and has been also employed as a carminative. Dose gtt. ij–v, every 3 or 4 hours.

TANACETUM—TANSY.

What is tansy?

Tansy is the *leaves* and *tops* of Tanacetum vulgare (*Nat. Ord.* Compositæ). It contains a volatile oil and a bitter principle (*tanacetin*). It is a gastro-intestinal irritant and diuretic, and in large doses causes death from respiratory paralysis, preceded by epileptiform convulsions of cerebral origin, and unconsciousness. It is used as a stimulating emmenagogue, but is a very dangerous remedy. The minimum fatal quantity is unknown. Dose gr. x–xxv, in infusion; of the oil, ♏j may be given.

APIOL.

What is apiol?

Apiol (not officinal), or parsley-camphor, is obtained from the volatile oil of the root of Petroselinum sativum (*Nat. Ord.* Umbelliferæ). It is very efficacious as a stimulating emmenagogue in *functional* and *anæmic amenorrhœa* and in *neuralgic dysmenorrhœa*, but is contraindicated in any condition of plethora. Dose gtt. iij–x in gelatin capsules given morning and evening for 4 or 5 days before the expected menstrual period.

CANTHARIDES—GUAIAC.

What are these substances?

Cantharides will be considered under "Irritants." The tincture is used as a stimulating emmenagogue, dose ♏iij–v, t. d., great care being taken to avoid strangury.

Guaiac has been considered with the "Alteratives."

(D) ON THE ALIMENTARY CANAL.

ORDER I.—EMETICS.

What are emetics, and how do they act?

Emetics are medicines which are given to induce vomiting. They may act either by directly irritating the stomach, thus causing expulsion of its contents in a reflex manner, when they are called *local emetics*, or by acting, after absorption, on the reflex centre of the medulla which governs emesis, when they are called *systemic emetics*. It does not always follow that a remedy is a systemic emetic because it causes vomiting when given hypodermically or per rectum, for it may be eliminated by, and produce irritation of, the gastric mucous membrane, thus exciting reflex vomiting.

For what purposes are emetics used?

Emetics are used (1) to unload the stomach; (2) to depress the circulatory system by inducing nausea (as in the early stages of bronchitis or of tonsillitis, in which emetics, frequently repeated in small doses, will sometimes arrest the inflammation); (3) to relax the muscular system and relieve spasm (as in spasmodic croup); (4) to promote secretion and excretion; (5) to expel foreign bodies or secretions from the air passages, and (6) as revulsives.

What are the contraindications to their employment?

They should never be employed in cases of cerebral or gastric inflammation, and should be used cautiously, if at all, in the latter stages of pregnancy, in hernia, or where great depression exists, as in the latter stages of capillary bronchitis or of croup.

Name the medicines employed as emetics.

The vegetable emetics are ipecac, apomorphine and mustard. The *mineral emetics* are zinc sulphate, copper sulphate, alum, turpeth mineral and tartar emetic.

IPECACUANHA—IPECAC.

What is ipecac, and what chemical principles does it contain?

Ipecac is the *root* of Cephaëlis Ipecacuanha (*Nat. Ord.* Rubiaceæ), a plant of Brazil. Its effects depend upon an alkaloid, *emetine*, which is combined with *ipecacuanhic acid.*

What are its physiological actions?

Locally applied, ipecac is an irritant, either to the skin or mucous membranes. Given *internally* in *small doses*, repeated, it increases the perspiration, saliva, bile, the secretions from the broncho-pulmonary and gastro-intestinal mucous membranes, and causes nausea. In sufficient amounts it greatly augments the secretions and induces vomiting, without much nausea or depression, no matter how exhibited, emesis being more rapid when it is taken by the mouth.

Toxic doses in animals depress the *respiration* and paralyze the *heart* directly. Post-mortem examination shows the mucous membranes of the stomach, intestines and lungs to be intensely congested. Sometimes, however, the lungs are almost exsanguine.

What are the medicinal uses of ipecac?

Ipecac is employed *as an emetic*, and is the safest remedy which can be given for this purpose, especially to children. It is particularly of service when it is desired to evacuate the contents of an overloaded stomach without producing much depression, as an adjunct to other remedies in *croup* and in the earlier stages of *capillary bronchitis.* In narcotic poisoning it is not as efficient as the mineral emetics.

As an *expectorant* it is added to cough medicines in the dry stage of bronchitis. As a *cholagogue* it is a valuable addition to purgative pills. As a *hæmostatic* it is highly recommended in *hæmoptysis* and *post-partum hemorrhage.*

In the treatment of *dysentery*, especially when epidemic, it is of great service, given in large doses (gr. xx–ʒij, every few hours). When thus administered a tolerance is soon established, and no nausea or vomiting is produced. It is also useful in various kinds of *diarrhœa*, especially of choleriform and tuberculous diarrhœa. *Reflex vomiting*, as the vomiting of pregnancy, has sometimes been arrested by minute doses of the wine of ipecac.

What are the preparations of ipecac and their doses?

Ipecac may be given in powder, dose as an *emetic* gr. x–xx ; as a *nauseant*, gr. ss–ij ; as an *expectorant* and *diaphoretic*, gr. ¼–½ ; as a *stomachic tonic* and *hepatic stimulant*, gr. $\frac{1}{12}$–⅛.

Extractum Ipecacuanhæ Fluidum (*fluid extract of ipecac*), dose as an emetic ♏xx–xxx, repeated until vomiting occurs.

Vinum Ipecacuanhæ (*wine of ipecac*) contains 7 per cent. of the fluid extract; dose as an emetic fʒj–iv.

Syrupus Ipecacuanhæ (*syrup of ipecac*) contains 5 per cent. of the fluid extract; as an emetic fʒj–ij may be given to a child, or ♏v–x as an expectorant.

Trochisci Ipecacuanhæ (*troches of ipecac*), each contains gr. ¼ of ipecac.

Powder of ipecac and opium (Dover's powder), *tincture of ipecac and opium*, and *troches of ipecac and morphine* have been considered under "Opium."

APOMORPHINÆ HYDROCHLORAS—APOMORPHINE HYDROCHLORATE.

What is apomorphine hydrochlorate?

It is the *hydrochlorate* of an *artificial alkaloidal substance* obtained from morphine by heating it with hydrochloric acid under pressure.

What are its physiological actions?

Given to warm-blooded animals in *small doses* it causes vomiting; after *large doses* there is salivation, violent vomiting and muscular tremors; *toxic doses* induce great restlessness, paresis, convulsions, hurried respiration and death from asphyxia, without the occurrence of emesis.

It is a systemic emetic, probably in medicinal doses stimulating the reflex centre for *vomiting*, but in large doses depressing and paralyzing it. No matter how administered, emesis takes place promptly, with but little nausea and rarely accompanied by much depression. Large doses appear to stimulate and finally paralyze the respiratory centre. It increases the *pulse-rate* by stimulating the accelerator fibres (?), and in large doses by stimulating the vasomotor centres, it raises the arterial pressure. In toxic doses it depresses the cardiac muscle and thus reduces the blood pressure. In large doses it is at first a *cerebral* stimulant, but later depresses and paralyzes the brain. The cause of the convulsion is not understood. It is a *muscle* poison.

What are the uses and doses of apomorphine hydrochlorate?

It may be employed *as an emetic* whenever prompt evacuation of the stomach is required, and may be administered either hypodermically or by the mouth. In *narcotic poisoning* it is highly recommended.

As an expectorant in the early stages of *acute bronchitis* or in *chronic bronchitis* without much expectoration, it is very serviceable, and can be advantageously used in *capillary bronchitis* of children both as an expectorant and emetic. The adult dose as an *emetic* is gr. $\frac{1}{16}$ hypodermically, or gr. $\frac{1}{10}$–$\frac{1}{8}$ by the mouth. As an *expectorant* smaller doses are required.

SINAPIS—MUSTARD.

What is mustard, and how is it used as an emetic?

Mustard is the *powdered seed* of Sinapis nigra and S. alba (*Nat. Ord.* Cruciferæ). Mustard flour is irritant to the mucous membranes as well as to the skin, and is a prompt and efficient local emetic, especially useful when torpor of the stomach is present. It will be more fully considered hereafter. Dose as an emetic from a teaspoonful to a tablespoonful in a glass of tepid water, repeated, if necessary, in 15 or 20 minutes.

What mineral emetics are employed?

Zinci Sulphas (*zinc sulphate*) is a prompt and efficient local emetic. Dose gr. x–xx, or even gr. xxx in narcotic poisoning.

Cupri Sulphas (*copper sulphate*) is a prompt local emetic, but more irritating than the zinc salt. Dose gr. iij–v, or even gr. x in narcotic poisoning. It is the best emetic in poisoning by phosphorus (*q. v.*).

Alumen (*alum*) is also a local emetic of value, especially useful in *membranous croup*, and useful also in *capillary bronchitis;* dose a teaspoonful of the powdered drug in molasses, or better, in syrup of ipecac.

Hydrargyri Subsulphas Flavus (*yellow mercurial subsulphate—Turpeth mineral*), used as an emetic in *croup;* dose gr. j–v repeated every 10 or 15 minutes until free vomiting occurs.

Antimonii et Potassii Tartras (*antimonium and potassium tartrate—tartar emetic*) is rarely used as an emetic because of the great depression which it induces; dose gr. j–ij.

Of these substances the three first will be found under the head of astringents, while the two last have already been considered.

ORDER II.—Gastric Sedatives.

What are gastric sedatives?

They are medicines employed to diminish gastric irritability, and thus allay nausea and vomiting.

What medicines are used for this purpose?

When vomiting is due to *acute irritation*, as from an overloaded stomach, the ingestion of acrid substances, or cholera morbus, it is best treated, after the contents have been evacuated, by minute doses of calomel (gr. $\frac{1}{10}$) with sodium bicarbonate (gr. j); pellets of ice dissolved in the mouth; lime-water and rest. A small dose of brandy will sometimes "settle the stomach." If *irritability persists*, small doses of morphine, or of diluted hydrocyanic acid or creasote, or bismuth and sodium bicarbonate answer better. When due to the formation of gases from *fermentation*, creasote, carbolic acid, thymol, sulphurous acid, the sulphites or charcoal are given.

When vomiting occurs on taking food after *long abstinence*, and perhaps *preceding irritation*, calomel and sodium bicarbonate in minute amounts, followed by small doses of brandy, and milk and lime-water by the teaspoonful at intervals, should be employed. *Ether-vomiting* is best met with teaspoonful doses of very hot water given every 10 or 15 minutes. *Reflex vomiting*, as of sea-sickness or of pregnancy, usually requires a medicine which will depress the centre in the medulla presiding over the act, as opium, the bromides or diluted hydrocyanic acid. Among other remedies used for the latter variety of vomiting may be mentioned, tincture of nux vomica (gtt. ¼–j), cerium oxalate (gr. ¼–v), wine of ipecac (gtt. ¼–ij), and Fowler's solution (♏¼–j). Counter-irritation over the epigastrium often aids the action of gastric sedatives. The above remedies have already been noticed or will be discussed in their appropriate places.

ORDER III.—CARMINATIVES.

What are carminatives ?

Carminatives are medicines employed to aid the expulsion of gases from the stomach and intestines.

What medicines are used as carminatives ?

The *aromatics*, which owe their virtues principally to the volatile oil which they contain, are especially used for this purpose. Other drugs containing volatile oils, as asafetida, eucalyptus, etc., are also carminative ; and ether is sometimes employed for the same object.

What are the general effects of the aromatics ?

Locally they are irritant and rubefacient. The oils are also local anæsthetics. *Internally* in *medicinal doses* they are gastric and intestinal stimulants, increasing peristalsis and temporarily increasing to a slight extent the force and frequency of the pulse. In *larger doses* they stimulate the brain and cause a species of intoxication. In *very large doses* they are irritant and narcotic poisons.

What are their medicinal uses ?

The aromatics are used internally as *carminatives ;* to prevent the *griping* of purgatives ; to *correct* the unpleasant *taste* or *smell* of other medicines, and as *gastric stimulants.*

Locally they are employed as *rubefacients*, *antiseptics* and *anodynes.* They should *never be used* when inflammation of the stomach or bowels is present, but in diarrhœa due to relaxation they are often of service.

Name the aromatics, their chemical constituents, preparations and doses.

CAPSICUM, or red pepper, is the *fruit* of C. fastigiatum and other species of capsicum (*Nat. Ord.* Solanaceæ). It contains a *resin*, a *fixed* and a *volatile oil.* It is *used* as a *condiment*, as a *gastric stimulant*, particularly in the case of drunkards, as an addendum to tonic pills, as a *carminative* in cases of feeble digestion, as a gargle in tonsillitis, and externally as a *rubefacient.*

Extractum Capsici Fluidum (*fluid extract of capsicum*), dose ♏v–x.

Tinctura Capsici (*tincture of capsicum*), dose ♏v–fʒj.

Oleoresina Capsici (*oleoresin of capsicum*), dose gr. ss–j.

Emplastrum Capsici (*plaster of capsicum*), for external use.

Piper (*pepper*) is the *unripe fruit* of Piper nigrum (*Nat. Ord.* Piperaceæ). It contains a *volatile oil*, an acrid *resin* and an alkaloid, *piperine*, which increases the respiration and circulation, dilates the pupil, and finally paralyzes the heart in systole. It has been used as an *antiperiodic.* Pepper is used as a *condiment* and sometimes as a *stomachic stimulant*, combined with other medicines, in atonic dyspepsia, and as a *carminative*.

Oleoresina Piperis (*oleoresin of pepper*), dose gr. ss–ij.

Piperina (*piperine*), dose gr. j–v.

Cinnamomum (*cinnamon*) is the inner *bark* of the shoots of C. zeylanicum and other species (*Nat. Ord.* Lauraceæ). It contains a *volatile oil*, *tannic acid*, etc. It is slightly astringent, and is used as a *carminative*, *flavoring ingredient* and *vehicle.*

Tinctura Cinnamomi (*tincture of cinnamon*), dose fʒj–ij.

Aqua Cinnamomi (*cinnamon water*), used as a vehicle.

Oleum Cinnamomi (*oil of cinnamon*), dose gtt. j–iij.

Spiritus Cinnamomi (*spirit of cinnamon*), contains 10 per cent. of the oil, dose ♏x–xxx.

Myristica (*nutmeg*); Macis (*mace*). These are parts of the *fruit* of Myristica fragrans (*Nat. Ord.* Myristicaceæ), the dried *arillus* being mace, and the *kernels of the seed*, nutmegs. Both contain *volatile oils.* They are aromatic stimulants, carminatives, and in large doses narcotics.

Oleum Myristicæ (*oil of nutmeg*), dose gtt. j–v.

Spiritus Myristicæ (*spirit of nutmeg*) contains 3 per cent. of the oil, dose fʒss–ij.

Caryophyllus (*cloves*) are the *unexpanded flowers* of Eugenia caryophyllata (*Nat. Ord.* Myrtaceæ). They contain *volatile oil*, *tannic acid*, *caryophyllin* and *eugenin*. They are gastric stimulants and carminatives, but are principally employed as a condiment. The oil is used as a local anodyne to carious teeth.

OLEUM CARYOPHYLLI (*oil of cloves*), dose gtt. iij–v.

PIMENTA, or allspice, is the *unripe berries* of Eugenia Pimenta (*Nat. Ord.* Myrtaceæ). They contain a *volatile oil*, and are carminative.

OLEUM PIMENTÆ (*oil of pimenta*), dose gtt. iij–v.

ZINGIBER (*ginger*) is the *rhizome* of Z. officinale (*Nat. Ord.* Zingiberaceæ). It contains a *volatile oil* and an acrid *resin*. It is a *gastric stimulant* and carminative, much employed in flatulency and colic and as an addition to other stomachics.

EXTRACTUM ZINGIBERIS FLUIDUM (*fluid extract of ginger*), dose ♏x–xxx.

TINCTURA ZINGIBERIS (*tincture of ginger*), dose fʒss–j.

SYRUPUS ZINGIBERIS (*syrup of ginger*), used as a vehicle for other medicines.

OLEORESINA ZINGIBERIS (*oleoresin of ginger*), used as a corrective to purgative pills to prevent griping; dose ♏ss–ij.

TROCHISCI ZINGIBERIS (*troches of ginger*), dose 2 or 3 lozenges.

CARDAMOMUM (*cardamom*) is the *fruit* of Elettaria Cardamomum (*Nat. Ord.* Zingiberaceæ), and contains a *volatile oil*. It is used as a gastric stimulant and carminative, and as an adjuvant and corrective of other medicines.

TINCTURA CARDAMOMI (*tincture of cardamom*), dose fʒj–ij.

TINCTURA CARDAMOMI COMPOSITA (*compound tincture of cardamom*) contains also caraway, cinnamon and cochineal; dose fʒj–ij.

PULVIS AROMATICUS (*aromatic powder*) consists of cinnamon and ginger (35 per cent. each), with cardamom and nutmeg (15 per cent. each). An excellent carminative preparation. Dose gr. x–xxx.

EXTRACTUM AROMATICUM FLUIDUM (*aromatic fluid extract*) is a fluid extract of aromatic powder. Dose ♏xv–xxx.

OLEUM CAJUPUTI (*oil of cajuput*) is the *volatile oil* distilled from the *leaves* of Melaleuca cajuputi (*Nat. Ord.* Myrtaceæ), and is very destructive to low organisms. It has been employed as a remedy against ascarides and, locally, in parasitic skin diseases, but is chiefly used as a gastric stimulant and carminative in flatulent colic and to prevent the griping of cathartics. Dose ♏j–v.

Calamus is the *rhizome* of Acorus calamus (*Nat. Ord.* Araceæ). It contains a *volatile oil* and a glucoside, *acorin.* It is an aromatic stimulant and somewhat tonic.

Extractum Calami Fluidum (*fluid extract of calamus*), dose ♏x–xxx.

Gaultheria is the *leaves* of G. procumbens, partridge-berry or teaberry (*Nat. Ord.* Ericaceæ). It contains a *volatile oil* (which has been considered under the head of "Salicylic Acid").

Oleum Gaultheriæ (*oil of gaultheria*), dose in rheumatism ♏v–xv.

Spiritus Gaultheriæ (*spirit of gaultheria*) contains 3 per cent. of the oil.

The following herbs, belonging to the *Nat. Ord.* Labiatæ, contain volatile oils, and are used as carminatives, gastric stimulants and flavoring ingredients :—

Lavendula (*lavender*) is the *flowers* of L. vera. *Oleum lavendulæ florûm* (*oil of lavender flowers*) and *oleum lavendulæ* (*oil of lavender*) are used in doses of gtt. j–v; *spiritus lavendulæ* (*spirit of lavender*) and *tinctura lavendulæ composita* (*compound tincture of lavender*) in doses of fʒss–j.

Mentha Piperita (*peppermint*) and Mentha Viridis (*spearmint*). The *leaves* and *tops* are officinal. The *oils** (*oleum menthæ piperita* and *oleum menthæ viridis*, dose gtt. j–v) are usually given in the form of *spirit* (*spiritus menthæ piperitæ* and *spiritus menthæ viridis*), dose ♏v–xxx. The *waters* (*aqua menthæ piperitæ* and *aqua menthæ viridis*) are used as vehicles. *Troches of peppermint* (*trochisci menthæ piperitæ*) are sometimes used in flatulent colic.

Rosmarinus (*rosemary*) is the *leaves* of R. officinalis. The *vola-*

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* *Menthol,* a camphene obtained from peppermint oil, is an antiseptic and local anodyne, and is a very efficient application for the relief of pain in neuralgia, muscular rheumatism and myalgia.

tile oil (*oleum rosmarini*) is carminative, but is chiefly used as an ingredient of rubefacient liniments.

HEDEOMA (*pennyroyal*). The *leaves* and *tops* are officinal. The *volatile oil* (*oleum hedeomæ*) may be given in doses of ♏j–v.

ORIGANUM is the *herb* of O. vulgare or marjoram.

MARRUBIUM (*horehound*). The *leaves* and *tops* of M. vulgare are used as gastric stimulants and expectorants.

SALVIA (*sage*). The *leaves* of S. officinalis are slightly astringent as well as aromatic. An infusion is sometimes used as a gargle in sore throat.

OLEUM THYMI (*oil of thyme*), a *volatile oil distilled* from Thymus vulgaris, contains much *thymol* (*q. v.*), and is therefore not only aromatic and carminative, but antiseptic and antifermentative.

The following *seed* are derived from plants belonging to the *Nat. Ord.* Umbelliferæ :—

FŒNICULUM (*fennel*), from F. vulgare. Of the *oil* (*oleum fœniculi*), the dose is gtt. v–x. A *water* (*aqua fœniculi*) is also officinal.

CARUM (*caraway*), from C. Carvi. Dose of the *oil* (*oleum cari*) gtt. j–x.

ANISUM (*anise*), from Pimpinella anisum. Dose of the *oil* (*oleum anisi*) gtt. v–xv. A *spirit* (*spiritus anisi*) and a *water* (*aqua anisi*) are also officinal.

CORIANDRUM (*coriander*), from C. sativum. The *oil* (*oleum coriandri*) is officinal.

ILLICIUM (*star-anise*) is the *fruit* of I. anisatum (*Nat. Ord.* Magnoliaceæ). It contains a volatile *oil* (*oleum illicii*), and is used as a substitute for anise.

VINUM AROMATICUM (*aromatic wine*) contains 1 per cent. each of lavender, origanum, peppermint, rosemary, sage and absinthium, and may be used as a gastric stimulant.

The following preparations are only used as flavors and vehicles :—

AURANTII AMARI CORTEX (*bitter orange peel*); AURANTII DULCIS CORTEX (*sweet orange peel*); AURANTII FLORES (*orange flowers*). These are respectively the *rind* of the *fruits* of Citrus vulgaris (bitter orange), and of C. aurantium (sweet orange), and the *partly* *expanded flowers* of both trees (*Nat. Ord.* Aurantiaceæ). The following preparations are officinal:—

Oil of orange flowers, or oil of neroli (*oleum aurantii florûm*); *orange flower water* (*aqua aurantii florûm*); *syrup of orange flowers* (*syrupus aurantii florûm*); *syrup of orange peel* (*syrupus aurantii*); *oil of orange peel* (*oleum aurantii corticis*); *spirit of orange* (*spiritus aurantii*); *elixir of orange* (*elixir aurantii*); *fluid extract of bitter orange peel* (*extractum aurantii amari fluidum*); *tinctures of bitter* and *of sweet orange peel* (*tinctura aurantii amari, tinctura aurantii dulcis*)—dose of either, f℥j–ij.

VANILLA, the *fruit* of V. planifolia (*Nat. Ord.* Orchidaceæ), contains *vanillin.* The *tincture* (*tinctura vanillæ*) is officinal.

The *oil of turpentine* is an excellent carminative and will be considered hereafter.

ORDER IV.—CATHARTICS.

What are cathartics?

Cathartics are medicines employed to produce an evacuation from the bowels either by increasing intestinal peristalsis, or by increasing the secretions of the canal and its appendages.

For what purposes are they used?

They are used (1) to unload the bowels; (2) to deplete the blood vessels by abstracting water from the blood; (3) to promote absorption; (4) to stimulate secretion; (5) to eliminate noxious material from the blood (as the poison of uræmia); (6) to act as revulsives, and (7) to influence the pelvic circulation.

How may cathartics be classified?

Cathartics are divided into laxatives, simple purgatives, salines and drastics.

LAXATIVES.

What are laxatives?

Laxatives are such substances as unload the bowels, acting without irritation and not causing purgation.

Name the laxatives.

Tamarind, manna, viola tricolor, cassia fistula, frangula, cascara sagrada, castor oil, sulphur and sulphurated potassa.

TAMARINDUS—TAMARIND. MANNA. VIOLA TRICOLOR.

What are these substances?

Tamarindus (*tamarind*) is the *preserved pulp of the fruit* of T. indica (*Nat. Ord.* Legumenosæ), a tree of India. Eaten as a preserve (℥ss–j) they are laxative. An infusion makes a pleasant refrigerant drink. It enters into *confection of senna.*

Manna is the *concrete saccharine exudation in flakes* of Fraxinus Ornus and other species (*Nat. Ord.* Oleaceæ). It contains *mannit*, *fraxin*, and a *resin* which is probably the laxative principle. Manna is usually combined with other cathartics. Dose for an adult ℥j–ij; for children, ʒj–iv.

Viola Tricolor, heartsease or pansy, is the wild-grown *flowering* herb V. tricolor (*Nat. Ord.* Violaceæ). It contains a *resin*, a *bitter principle*, etc., and is a mild laxative, with sometimes a diuretic and diaphoretic action. It is especially recommended as a cathartic in scaly skin diseases. There are no officinal preparations. A fluid extract may be given in doses of fʒss–j to an adult or ♏j–v to a child, twice daily in water, half an hour before meals.

CASSIA FISTULA. FRANGULA. CASCARA SAGRADA.

What are these substances?

Cassia Fistula is the *fruit* of C. Fistula or purging cassia (*Nat. Ord.* Leguminosæ). It is an ingredient of the *confection of senna;* dose ʒj–℥j.

Frangula is the *bark* of Rhamnus Frangula or alder buckthorn (*Nat. Ord.* Rhamnaceæ). It contains *frangulin* and *emodin*, and as it is an active emetic and hydragogue when fresh, it should be kept a year at least before being used; dose of the *fluid extract* (*extractum frangulæ fluidum*) ʒss–j.

Cascara Sagrada (not officinal) or chittem bark, is the *bark* of Rhamnus purshiana (*Nat. Ord.* Rhamnaceæ), a tree of California. It contains several resins and is an efficient laxative, very useful in habitual constipation; dose of a fluid extract ♏x–xxx.

OLEUM RICINI—CASTOR OIL.

What is castor oil?

It is a *fixed oil* obtained from the *seed* of Ricinus communis, or palmi christi (*Nat. Ord.* Euphorbiaceæ).

What are its effects and uses?

In *small doses* it is a mild laxative, in *larger amounts* a simple purgative. Applied with friction to the abdomen of children it frequently purges. It is very useful whenever it is desired to evacuate the bowels and remove any irritant materials, as undigested food. For this purpose it is often used in acute dysenteries and diarrhœas, especially of children; dose f℥j–iv, best given mixed with equal parts of glycerin and flavored with some aromatic oil.

SULPHUR.

What is sulphur?

Sulphur is a chemical element obtained by purifying native sulphur and by decomposing native sulphides.

What are its effects, uses and preparations?

It acts as a mild laxative and is eliminated by all the excretions. Its continued use causes flatulence from the formation of sulphuretted hydrogen. It is used as a *laxative*, especially in cases of *hemorrhoids*, and as an *alterative* both internally and externally in *chronic rheumatism*, *muscular rheumatism*, *sciatica*, and in various forms of *skin disease*, especially those of parasitic origin. It is also used as an *expectorant*. It is officinal as SULPHUR SUBLIMATUM (*sublimed sulphur*, sometimes called "flowers of sulphur"), SULPHUR LOTUM (*washed sulphur*), and SULPHUR PRÆCIPITATUM (*precipitated sulphur*); dose of either ʒj–iv in syrup. UNGUENTUM SULPHURIS (*sulphur ointment*, containing 30 per cent. of sulphur) and UNGUENTUM SULPHURIS ALKALINUM (*alkaline sulphur ointment*, containing 20 per cent. of sulphur and 10 of potassium carbonate), are used externally.

POTASSA SULPHURATA—SULPHURATED POTASSA.

What is sulphurated potassa?

Sulphurated potassa, or liver of sulphur, is an uncertain compound containing about 50 per cent. of potassium sulphide.

In *small doses* it is decomposed in the stomach and acts like sulphur. In *large doses* it is a gastro-intestinal irritant and has produced death. It may be *used* to fulfil the indications of sulphur, but is chiefly employed as an *alterative* where a tendency to the formation of abscesses exists, in chronic rheumatism and in scaly skin affections. It is used *externally* in the form of bath or ointment; dose gr. ij–x.

SIMPLE PURGATIVES.

What are the simple purgatives?

They are medicines employed to produce active purgation, but which do not produce sufficient irritation to cause inflammation or depression, even when large doses are given.

Name the agents of this group.

Castor oil, rhubarb, juglans, aloes, senna, leptandra, euonymus, and mercurials.

Castor oil has been described with the *laxatives*.

RHEUM—RHUBARB. JUGLANS.

What are these medicines?

Rhubarb is the *root* of Rheum officinale and of other species (*Nat. Ord.* Polygonaceæ). It contains *chrysophan*, *chrysophanic acid*, 4 resins (*erythroretin*, *emodin*, *phæoretin* and *aporetin*), *rheotannic* and *rheumic acids.* It is a tonic, mild purgative, and an astringent, owing to the rheotannic acid, and hence after purging it has a tendency to cause constipation. It tinges the milk and urine yellow, and stimulates the flow of bile. It is much used in *diarrhœa* from relaxation in the early stages of *summer complaint* of children and in *dyspepsia* with constipation. The officinal preparations and their doses are: the *extract* (*extractum rhei*), gr. v–xx; *pills* (*pilulæ rhei*) each contain gr. iij of rhubarb; *compound pills* (*pilulæ rhei compositæ*) each contain gr. ij of rhubarb, gr. iss of aloes with myrrh and oil of peppermint; dose No. j–iv; *compound powder* (*pulvis rhei compositus*) contains rhubarb and magnesia, dose ʒss–j; *fluid extract* (*extractum rhei fluidum*), ♏xx–xxx; *mixture of rhubarb and soda* (*mistura rhei et sodæ*), for a child fʒss–j; for an adult fʒj–iv; *syrup* (*syrupus rhei*), ♏x–xx for an infant; *aromatic* or *spiced syrup* (*syrupus rhei aromaticus*), for an infant fʒss-j ; *tincture* (*tinctura rhei*), fʒi-ij ; *aromatic tincture* (*tinctura rhei aromaticus*), fʒss-j ; *sweet tincture* (*tinctura rhei dulcis*), fʒj-ij; *wine* (*vinum rhei*), fʒj-iv.

JUGLANS is the *inner bark* of the *root* of Juglans cinerea, butternut or white walnut (*Nat. Ord.* Juglandaceæ). It is used as a substitute for rhubarb, which it resembles in action. The *extract* (*extractum juglandis*) may be given in doses of gr. x-xxx.

ALOE—ALOES.

What is aloes?

Aloes is the *inspissated juice* of the *leaves* of Aloe socotrina (*Nat. Ord.* Liliaceæ). It contains a neutral crystalline principle, *aloin.* It is a tonic to the mucous membrane and a purgative, being slow in its action and affecting principally the large intestine, and apparently causing a determination of blood to the pelvic viscera. It is also a hepatic stimulant. It is *used* in habitual constipation, especially when torpor of the large bowel exists ; in *hemorrhoids* from relaxation of the veins and congestion of the portal circle ; in *amenorrhœa* and in *menorrhagia* due to want of tone of the uterine vessels. The officinal preparations are made of *purified aloes* (*aloe purificata*), and are, *pills* (*pilulæ aloes*) each containing gr. ij of aloes ; *pills of aloes and mastich* (*pilulæ aloes et mastiches*), called also *Lady Webster's dinner-pill*, each containing gr. ij of aloes ; *pills of aloes and myrrh* (*pilulæ aloes et myrrh*) or *Rufus' pill*, each containing gr. ij of aloes ; *pill of aloes and iron* (*pilulæ aloes et ferri*), each containing gr. j of aloes, of dried ferrous sulphate and of aromatic powder (the two last named pills are useful in amenorrhœa) ; *pills of aloes and asafetida* (*pilulæ aloes et asafœtidæ*), each containing gr. j½ of aloes, asafetida and soap (useful in flatulent dyspepsia with constipation) ; *aqueous extract* (*extractum aloes aquosum*), dose gr. j-v ; *tincture* (*tinctura aloes*), dose fʒ j-iv ; *tincture of aloes and myrrh* (*tinctura aloes et myrrhæ*), dose fʒj-ij, and *wine* (*vinum aloes*), dose fʒss-j ; *aloin* (not officinal), dose gr. $\frac{1}{10}$-j.

SENNA. LEPTANDRA. EUONYMUS.

What are these medicines?

SENNA is the *leaflets* of several species of Cassia (*Nat. Ord.* Legumenosæ). It contains *cathartic acid*, *chrysophanic acid*, *sennit* and *sennacrol.* It is a prompt and efficient purgative, and probably acts on the entire length of the intestine, causing some griping. It is a mild hepatic stimulant. It is used where a prompt and decided cathartic effect is desired, usually in combination to prevent griping. Its preparations are, the *fluid extract* (*extractum sennæ fluidum*) dose fʒj–iv; *confection* (*confectio sennæ*), an excellent purgative during pregnancy, ʒj–ij; *compound infusion* (*infusum sennæ compositum*), also called *black draught*, f℥ss–iv; *syrup* (*syrupus sennæ*) fʒj–ij; *compound powder of glycyrrhiza* (or of *liquorice*) (*pulvis glycyrrhizæ compositus*), an excellent purgative, dose a teaspoonful at bedtime.

Leptandra is the *rhizome* and *rootlets* of L. virginica, Culver's root or physic (*Nat. Ord.* Scrophulariaceæ). It contains *leptandrin*, and is a feeble stimulant to the liver and intestinal glands. Dose of the *extract* (*extractum leptandræ*) gr. j–iv; of the *fluid extract* (*extractum leptandraæ fluidum*) fʒss–j.

Euonymus, or wahoo, the *bark* of E. atropurpureus (*Nat. Ord.* Celastraceæ), contains a bitter principle, *euónymin*, *resins*, *euonic acid*, etc.; is a powerful hepatic stimulant, and increases the intestinal secretion. It is *used* as a purgative in torpidity of the liver and intestines. Dose of the *extract* (*extractum euonymi*) gr. ij–iv, in pill.

Mercurial Cathartics.

What mercurials are used as simple purgatives?

Hydrargyri Chloridum Mite (*mercurous chloride* or *calomel*), dose gr. ss–j to x, at bedtime; and Massa Hydrargyri (*mercurial* or *blue mass*), dose gr. v–xv. They will be found under the head of "*Alteratives.*"

Saline Cathartics.

What are saline cathartics?

The saline cathartics are certain *salts* which produce an evacuation of the bowel not only by increasing peristalsis from their irritant effect, but also by promoting outward osmosis from the blood, thus rendering the stool liquid, depleting the blood vessels, and consequently favoring absorption of effused fluids.

Name the medicines of this group.

The magnesium salts, some of the sodium and some of the potassium salts, and manganese sulphate.

Describe the effects, uses, preparations and doses of the magnesium salts.

Magnesia and Magnesia Ponderosa (*heavy magnesia*—is similar to *Henry's*, *Husband's* and *Ellis'* magnesias), sometimes called *calcined magnesia;* are antacid and cathartic; are mild in their action and are excellent preparations for children; dose as an antacid gr. xx, as a cathartic ʒj or more.

Magnesii Carbonas (*magnesium carbonate—magnesia alba*), not much used; dose as an antacid gr. x–xx, as a cathartic ʒj–ij.

Magnesii Sulphas (*magnesium sulphate—Epsom salt*), is much more powerful than the preceding preparations, and produces free, watery purgation with very little irritation. It is used as a *purgative* to remove *fecal accumulations;* as a *depletant* in *entero-colitis* and *acute dysentery* (with opium); to *aid absorption* (given in very concentrated solutions) in *dropsical effusions*, especially hydrothorax; and for the relief of *colica pictonum* and other forms of lead poisoning; dose f℥ss–j.

Magnesii Citras Granulatus (*granulated magnesium citrate*), dose ʒj–iv taken in water while effervescing.

Liquor Magnesii Citratis (*solution of magnesium citrate*). The citrates are similar in effect to the sulphate, but are more apt to irritate; dose half to a whole bottle full.

What salts of sodium are used as cathartics?

Sodii Sulphas (*sodium sulphate—Glauber's salt*) is similar in its effects to Epsom salt, but more irritant and disagreeable. It is a mild hepatic stimulant. It is not much used; dose ʒj–iv.

Sodii Phosphas (*sodium phosphate*) is a mild cathartic and hepatic stimulant. It is an excellent purgative in *catarrhal conditions of the bowel*, in *catarrhal jaundice*, and in *chronic infantile diarrhœa* with pasty stools; dose ʒj–℥j.

Sodii Pyrophosphas (*sodium pyrophosphate*) resembles the preceding salt in action and uses; dose ʒss–iv.

What potassium salts are used as cathartics?

POTASSII SULPHAS (*potassium sulphate*) was formerly, but is not at present, much used; dose gr. xv–ʒj.

POTASSII BITARTRAS (*potassium bitartrate—cream of tartar, cremor tartar*) is a diuretic, refrigerant and cathartic. In overdoses it causes gastro-enteritis; dose as *diuretic* gr. x–ʒj, as a *mild laxative* ʒss–j; as a saline cathartic ℥ss.

POTASSII TARTRAS (*potassium tartrate—soluble tartar*) is cathartic and diuretic; dose ℥ss–j.

POTASSII ET SODII TARTRAS (*potassium and sodium tartrate—Rochelle salt*) resembles Epsom salt, but not so powerful; dose ℥ss–j.

PULVIS EFFERVESCENS COMPOSITUS (*compound effervescing powder—seidlitz powder*) consists of Rochelle salt ʒij with sodium bicarbonate gr. xl in a blue, and tartaric acid gr. xxxv in a white paper, their contents to be dissolved separately, the solutions mixed and taken while effervescing, on an empty stomach.

What is manganese sulphate?

MANGANI SULPHAS (*manganese sulphate*) has been discussed with the tonics. It is a hepatic stimulant and cathartic also, resembling Epsom salt, but is a dangerous remedy, and is not much employed; dose gr. j–v.

DRASTIC CATHARTICS.

What are drastic cathartics?

Cathartics which cause much irritation and act very powerfully are so called. Most of them in overdoses cause irritant poisoning. When they produce very free, watery evacuations they are sometimes spoken of as "*hydragogues.*" The more powerful drastics are used as revulsives in cerebral affections.

Describe the medicines employed as drastics.

JALAPA (*jalap*), the *tuber* of Exogonium purga (*Nat. Ord.* Convolvulaceæ), a Mexican plant, contains a *resin*, to which its purgative properties are due.

It is a prompt and powerful hydragogue and cholagogue in overdoses, causing gastro-intestinal irritation and even death. It is *used* as a hydragogue in *dropsies* of cardiac or renal origin, as in ascites or anasarca, and sometimes as a cerebral revulsant. Its preparations are the *abstract* (*abstractum jalapæ*), dose gr. j–x; *compound powder* (*pulvis jalapæ compositus*), containing 35 per cent. of jalap with cream of tartar, dose gr. x–ʒj; and the *resin* (*resina jalapæ*), dose gr. j–v.

Bryonia (*bryony*), the *root* of B. alba and B. dioica (*Nat. Ord.* Cucurbitaceæ), European climbing vines; contain a glucoside, *bryonin*, probably the active principle. It is a violent hydragogue cathartic resembling jalap in its effects, and also proving diuretic. It is *used* as a hydragogue in dropsies, especially in hydrothorax and hydropericardium. The *tincture* (*tinctura bryoniæ*) may be used in doses of fʒss–j.

Podophyllum, the *rhizome* and *rootlets* of P. peltatum, May-apple or mandrake (*Nat. Ord.* Berberidaceæ), a common indigenous plant, containing a resinous substance *podophyllotoxin*, consisting of picropodophyllin, the purgative principle, and podophyllinic acid, which is inert.

It is an active hydragogue and cholagogue, acting slowly and especially on the upper part of the small intestine and causing much irritation. In overdoses it is a gastro-intestinal irritant capable of causing death.

It is used as a purgative and cholagogue in acute and chronic *constipation*, in *bilious attacks* and in *torpor of the liver.* The dose of the *abstract* (*abstractum podophylli*) is gr. ¼–j; of the *extract* (*extractum podophylli*) gr. v–xv; of the *fluid extract* (*extractum podophylli fluidum*) ♏x–xx; of the *resin* gr. ⅒–½; the latter preparation is the only one in common use.

Podophyllotoxin (not officinal) may be used in the form of a 1 per cent. alcoholic solution, the dose of which is gtt. x–xxx. It is used hypodermically, dose gr. ¼.

Iris, the *rhizome* and *rootlets* of I. versicolor, or blue-flag (*Nat. Ord.* Iridaceæ); contains a purgative *resin.* It is a powerful stimulant to the liver and intestinal glands, acting like podophyllum, but with less irritation. It is diuretic, and in overdoses irritant and depressant. It is *used* in *dropsies*, *jaundice of malarial origin*, and *torpor of the liver.* Dose of the *extract* (*extractum iridis*) gr. ij–iv; of the *fluid extract* (*extractum iridis fluidum*) ♏x–ʒj.

Chelidonium, celandine or tetterwort, is the *herb* C. majus (*Nat.*

Ord. Papaveraceæ); contains *chelerythrine* and *chelidonine* combined with *chelidoninic acid.* It is used as a hydragogue cathartic, and is supposed to possess cholagogue effects and some narcotic properties. It may be given in doses of gr. x–ʒj; in a fluid extract or infusion.

SCAMMONIUM (*scammony*) is a *resinous exudation* from the *root* of Convolvulus scammonia (*Nat. Ord.* Convolvulaceæ), a Syrian plant. The resin *scammonin* is the active portion. It is a violent hydragogue, resembling jalap in its action, but much more irritating. It is never given except in combination with other cathartics. The dose of the *resin* (*resina scammonii*) is gr. ij–viij. It is one of the ingredients of *compound extract of colocynth.*

COLOCYNTHIS (*colocynth*), the *fruit*, deprived of the rind, of Citrullus colocynthis, or bitter cucumber (*Nat. Ord.* Cucurbitaceæ), contains a glucoside (the purgative principle) called *colocynthin*, also a *resin*, *colocynthitin*, etc.

It is an hepatic stimulant and violent hydragogue, and in overdoses causes death from gastro-enteritis. It is never given alone, but is used in small doses to increase the effects of milder cathartics. The *extract* (*extractum colocynthidis*) is used in combination with other purgatives, dose gr. ij–v; *compound extract* (*extractum colocynthidis compositum*) containing also aloes, resin of scammony, cardamom and soap, dose gr. iij–x.

CAMBOGIA (*gamboge*) is a *gum-resin* obtained from Garcinia Hanburii (*Nat. Ord.* Guttiferæ), a tree of Siam. The resin is the purgative principle and is called *cambogic acid.* It is a very powerful hydragogue cathartic, and in overdoses has caused death. It is rarely used alone; dose gr. ij–v.

PILULÆ CATHARTICÆ COMPOSITÆ (*compound cathartic pills*). Each pill contains of compound extract of colocynth gr. j⅓, of calomel and of abstract of jalap each gr. j, and of gamboge gr. ¼.

ELATERINUM (*elaterin*) is a *neutral principle* extracted from elaterium, a substance deposited by the juice of the fruit of Ecballium elaterium or squirting cucumber (*Nat. Ord.* Cucurbitaceæ). It is one of the most powerful of the hydragogues, also proving diuretic, and in excessive doses often causing death. It is much *used* in *dropsies*, in *uræmia* and as a cerebral *revulsive.* The dose is gr. $\frac{1}{20}$; of the *trituration* (*trituratio elaterini*) gr. ¼–j.

OLEUM TIGLII (*croton oil*) is a *fixed oil* obtained from the *seeds* of Croton tiglium (*Nat. Ord.* Euphorbiaceæ), a tree of India. The active principle has not been isolated.

When applied to the skin croton oil is an intense irritant, causing a papular eruption which soon becomes pustular. Given internally it is a powerful and rapid hydragogue cathartic, causing severe griping pains and to some extent depressing the circulation. In overdoses it produces great depression and often proves fatal. In *obstinate constipation* it is very serviceable, and as a *revulsive* in cerebral affections, as apoplexy, it is the best hydragogue. It has been used externally as a *counter-irritant* (*q. v.*). Dose gtt. j, which may be given in pill or emulsion, or mixed with a few drops of glycerin or olive oil and placed on the patient's tongue when he cannot or will not swallow.

ENEMATA.

What are enemata?

Enemata are liquids injected into the rectum. They may be *nutritive*, *cathartic* or *forced enemata.*

Nutritive enemata are used to nourish the patient when the stomach cannot retain or digest food. They should be small in amount, not exceeding f℥iij–iv at a time, nor should they be too frequently repeated, else they will cause irritability of the rectum. They should be combined with some digestant, as pepsin or pancreatin.

Cathartic enemata are used to unload the bowels when irritation or inflammation of the stomach is present; to aid the action of cathartics taken by the mouth; to remove fæcal accumulations or retained and irritating secretions from the large intestine; to relieve tympanites; to remove ascarides; or to act as revulsives. The fluid used may be cold or warm water, either simple or medicated, and the quantity will depend on the case. The injection should be made slowly and carefully, and the introduction of air is to be avoided.

Forced enemata are made slowly and gradually, the fluid, either warm water or warmed oil, being poured into a large funnel or rubber bag (fountain syringe) to which a long rubber tube is attached, armed with an injection pipe. By elevating the funnel or bag the fluid flows in a steady stream, the force being regulated by the height at which the bag is held. Forced enemata are employed principally to reduce intussusception of the bowels.

ORDER V.—ANTHELMINTICS.

What are anthelmintics?

Anthelmintics are medicines used to kill (*vermicides*) or cause the expulsion of (*vermifuges*) intestinal worms.

How are they administered?

They should be given fasting, and should be followed in 4 to 6 hours by a purgative, as calomel or castor oil.

Describe the medicines used as anthelmintics.

SPIGELIA, or pinkroot, the *rhizome* and *rootlets* of S. marilandica or Carolina pink (*Nat. Ord.* Loganaceæ), contains a *bitter principle*, *volatile oil*, *resin*, *tannic acid*, etc. It slows the heart by stimulating the inhibiting centres, reduces arterial pressure by depressing the heart, and in overdoses quickens the pulse, increases the blood pressure, dilates the pupil, causes delirium, and, in fatal cases, death from respiratory paralysis. It is very efficient in causing the expulsion of *lumbrici*, but should be followed by a purge. Dose of the *fluid extract* (*extractum spigeliæ fluidum*) fʒj–ij, or to a child gtt. x on sugar.

CHENOPODIUM or American wormseed, the *fruit* of C. ambrosioides or Jerusalem oak (*Nat. Ord.* Chenopodaceæ), contains a *volatile oil*, to which its effects are due. It is a very efficient remedy for the expulsion of lumbrici, and should be followed by a brisk cathartic. The *oil* (*oleum chenopodii*) is given in doses of gtt. v–x on sugar, to a child 3 years old, before meals.

SANTONICA or Levant wormseed is the *flower-heads* of Artemisia maritima (*Nat. Ord.* Compositæ). The active principle is *santonin*. *Large doses* cause salivation, rapid breathing, slow labored pulse, trembling yellow vision and yellow urine, unconsciousness, convulsions, dilated pupils and death. It is used almost exclusively as a remedy for lumbrici. Dose of *santonin* (*santoninum*) for an adult gr. ss–v; for a child 2 years old gr. ¼. *Sodium santoninate* (*sodii santoninas*) is more rapidly absorbed and milder in action. *Troches of sodium santoninate* (*trochisci sodii santoninatis*) each contain gr. j of the salt.

AZEDARACH, the *bark* of the *root* of Melia azedarach or pride of

China (*Nat. Ord.* Meliaceæ) is used as a remedy against lumbrici. It is given in decoction (℥iv to water Oij boiled to Oj) in f℥ss doses, every 2 or 3 hours until it affects the bowels.

ASPIDIUM, the *rhizome* of A. filix-mas or male fern and A. marginale (*Nat. Ord.* Filices), contains *filicic acid*, *volatile* and *fixed oils*, *resin*, etc., and is used as a tæniacide. Like all remedies employed for this purpose, its administration should be preceded by a fast of 24 hours and followed by a brisk cathartic. In overdoses it has caused death from enteritis. Dose of the *oleoresin* (*oleoresina aspidii*) fʒss–j.

GRANATUM (*pomegranate*), the *bark* of the *root* of Punica granatum (*Nat. Ord.* Granataceæ), contains two active alkaloids, *pelletierine* and *isopelletierine*, which are powerful tæniacides, as is also granatum itself. In overdoses they are said to act on the muscles like woorara. Dose of pomegranate in decoction (℥ij to water Oij boiled to Oj) f℥ij repeated 3 times at an hour's interval, before breakfast; of pelletierine tannate gr. v–x.

BRAYERA (*kooso*), the *female inflorescence* of B. anthelmintica (*Nat. Ord.* Rosaceæ), contains *kosin*, a crystalline resin, and is used as a tæniacide; dose of the *infusion* (*infusum brayeræ*) f℥ij–iv repeated in an hour; of the *fluid extract* (*extractum brayeræ fluidum*), fʒij–iv.

KAMALA, the *glands* and *hairs* from the capsules of Mallotus philippinensis (*Nat. Ord.* Euphorbiaceæ), contains *rottlerin*, a resinoid substance, and is used as a tæniacide; dose ʒj–ij of the powder in syrup, or given in the form of tincture.

PEPO (*pumpkin-seed*), the *seed* of the Cucurbita pepo or pumpkin (*Nat. Ord.* Cucurbitaceæ), contains a *resin*, and is one of the most powerful tæniacides in the materia medica and perfectly harmless; dose of the fresh seed (powdered with sugar) ℥j–ij.

OLEUM TEREBINTHINÆ (*oil of turpentine*) is an efficient but not a harmless remedy for tænia and lumbrici. It will be found under the head of "*diuretics.*" Dose f℥ss–j combined with castor oil.

HYDRARGYRI CHLORIDUM MITE (*mercurous chloride or calomel*) is used alone or combined with other anthelmintics for the expulsion of lumbrici and (rarely) tænia. It should be given in full purgative [illegible] (*v. alteratives*).

What remedies are used for the destruction of ascarides?

Mild purgatives, as *calomel* or *sulphur*, may be used to dislodge them from the small intestine, but *injections of quassia-infusion*, *common salt*, *tannin*, *alum* or *lime water* must be employed to get rid of those in the colon. *Injections of sweet oil* at bedtime are useful to kill any which may be in the rectum, and prevent the excessive itching which they cause. The child should be prevented from scratching the anus, as the ova are very tenacious, and adhering to the finger nails may be conveyed to the mouth and reproduce the trouble.

What are useful adjuncts to the anthelmintics?

Iron and the *bitter tonics*, by restoring tone to the mucous membranes, prevent the excessive secretion of mucus which forms a suitable nidus for the development of parasites.

Class III.—Medicines acting on the body by their effect on the various secretions and excretions.

ORDER I.—DIURETICS.

What are diuretics?

Diuretics are medicines used to increase the excretion of urine, acting either *directly* on the secreting cells of the kidney, or *indirectly* by their influence on the blood-pressure in the glomeruli.

For what purposes are they used?

They are used (1) to maintain the *function of the kidneys* in suppression of urine independent of the cause; (2) to promote the excretion of *urinary solids* (injurious waste products) or of poisons from the blood, as in uræmia, gout, rheumatism, fevers, and in cases of various metallic and vegetable poisons; (3) to promote the excretion of *water*, thus tending to dilute highly concentrated urine or to aid in the removal of effused (dropsical) fluids; and (4) to alter the *chemical reaction* of the urine and render that fluid more bland, thus lessening vesical and urethral irritation and any tendency which may exist to the formation of calculi.

A certain relation exists between the functions of the skin, kidneys and bowels, so that free catharsis or free diaphoresis will diminish the urinary secretion and *vicê versâ.*

How may diuretics be classified?

They may be divided into alkaline, hydragogue and alterative diuretics.

ALKALINE DIURETICS.

What are the alkaline diuretics?

They are those salts which, without materially increasing the amount of water, usually increase the elimination of its solid ingredients and modify or alter its chemical reaction.

Name the alkaline diuretics.

The potassium and lithium salts.

POTASSIUM.

What is the source of potassium?

Potassium is obtained from the ashes of plants, from native *nitre*, and from *tartar* or *argol*, deposited from wine during fermentation.

What are the general physiological actions of its salts?

Locally applied *caustic potash* destroys tissues by abstracting water, dissolving albumin and saponifying fats. *Internally* in *small doses* before meals, they increase the acidity of the gastric juice; in *large doses*, or after meals, they neutralize the acid present in the stomach. The *bicarbonates*, when taken on an empty stomach, enter the blood readily, and abstracting the base from basic and neutral potassium phosphate convert it into the acid phosphate, thus *increasing the acidity of the urine;* but if taken after or during meals, they are decomposed in the stomach, and entering the blood as a carbonate, *diminish the acidity of the urine.* The *salts formed with the vegetable acids* are converted into carbonates in the system and render the urine less acid. Potassium and its salts promote oxidation (and hence cause emaciation when used continuously), decreasing the amount of uric acid and increasing the urea excreted by the urine. The *nitrate* and *chlorate* are not decomposed in the system, and having effects peculiar to themselves, will be separately considered. All the potassium salts are protoplasmic poisons, in very large doses paralyzing the heart in diastole by direct action on its muscle and contained ganglia. They also depress and paralyze the functions of the brain and spinal cord. They all prove diuretic, increasing the amount of water passed and, by promoting oxidation, the elimination of urea. *Poisoning* by *caustic potash* is due to its corrosive properties, and if recovery takes place from the acute effects, various stenoses are apt to follow. The *carbonate* in overdoses causes violent gastro-enteritis with great cardiac depression and sometimes paralysis. The *treatment* of potassium poisoning consists in neutralizing the alkali by a vegetable acid, giving demulcents and fixed oils as protectives, and stimulating if requisite.

What are the therapeutical uses of the potassium salts?

The potassium salts are used as *diuretics* (increasing as they do both the water and salts of the urine, and converting uric acid into the more soluble urea as well as rendering the urine alkaline) in *acute rheumatism*, *uric acid diathesis*, in *desquamative nephritis*, and to alkalinize the urine in *cystic* or *urethral irritation*.

What are the potassium preparations, their uses and doses?

LIQUOR POTASSÆ (*solution of potassa*) contains 5 per cent. of potassium hydrate, and is *antacid* and *diuretic*. It is used to render the urine alkaline in cystic irritability and in gonorrhœa; dose ♏x–xx freely diluted.

POTASSII CARBONAS (*potassium carbonate*) is *antacid* and *diuretic*, but is more irritating to the stomach than the bicarbonate; dose gr. x–xx.

POTASSII BICARBONAS (*potassium bicarbonate*) is *antacid* and *diuretic;* dose gr. xx–ʒj. It is much used in the treatment of *acute rheumatism*, especially in plethoric persons (℥iss are given in the first twenty-four hours, half as much during the second day, and afterward enough to keep the urine alkaline).

POTASSII CITRAS (*potassium citrate*) is used as a *diuretic* in acute rheumatism and as a refrigerant diaphoretic in fevers and acute inflammations; dose gr. xx in solution every hour or two.

LIQUOR POTASSII CITRATIS (*solution of potassium citrate*) contains 8 per cent. of the bicarbonate and 6 per cent. of citric acid; dose f℥ss.

MISTURA POTASSII CITRATIS (*mixture of potassium citrate—neutral mixture*) is made by neutralizing fresh lemon-juice with the bicarbonate; dose f℥ss–j.

Effervescing draught (not officinal) is made by adding f℥j of a solution of the bicarbonate (ʒj–f℥iij) to f℥j of lemon-juice and water (equal parts). It is particularly acceptable to febrile patients with irritable stomachs.

POTASSII ACETAS (*potassium acetate*) is *antacid*, *diuretic*, and in large doses a *mild cathartic*. It is chiefly used as a *diuretic* in acute rheumatism and to some extent in dropsies, and in uric acid diathesis; dose gr. xx–ʒj.

POTASSII BITARTRAS (*potassium bitartrate—cream of tartar*) is a *diuretic* and *saline cathartic* (*q. v.*) much employed in dropsies.

POTASSII NITRAS (*potassium nitrate—saltpetre—nitre*) *locally* applied is a powerful irritant to the mucous membranes and to raw surfaces. It passes through the system unchanged, and is eliminated chiefly by the urine, increasing the amount passed but not affecting its reaction to the same extent as the other salts. *Poisoning* occurs more frequently from the nitrate than from any other potassium salt, the symptoms being burning pain in the throat and epigastrium, hæmatemesis and bloody stools, muscular weakness, syncope, collapse sometimes preceded by convulsions or paralysis, suppression of urine and death. The *treatment* consists in evacuating the contents of the stomach and administering opiates, demulcents and stimulants.

It is *used* in *acute rheumatism* as a *diuretic*, but is probably inferior to the salts formed with the vegetable acids. It is used in *fevers* for the same purpose and has been given in small doses combined with Dover's powder as a *diaphoretic* in *acute muscular rheumatism*. *Papers of potassium nitrate* (*charta potassii nitratis*), consisting of strips of unsized paper immersed in a 20 per cent. solution of the salt, are burned and the fumes inhaled with success in spasmodic asthma. It is probable that the *nitrite* is formed by the combustion and is the active agent in these cases.

POTASSII CHLORAS (*potassium chlorate*) is a *local* irritant. *Internally* in large doses it causes gastro-enteritis, affects the circulation as do the other potassium salts, damages the blood corpuscles and interferes with oxygenation by the formation of methæmoglobin, and produces a condition of acute tubal nephritis. Cases of poisoning are not infrequent, and death is usually preceded by profuse salivation, great dyspnœa, cyanosis, delirium, coma, tonic and clonic spasms, and sometimes ecchymoses and jaundice. It increases the excretion of urine, but does not affect its chemical reaction.

It has been *used* as a diuretic in dropsies, but is dangerous and inferior to other preparations. As an *alterative* in the exanthemata it is now little employed. In *mercurial*, *follicular* or *aphthous stomatitis* it is of unquestionable value, given internally with sugar or used as a gargle. In ordinary *sore throat* and in *tonsillitis* it is useful as a local application; dose gr. v–xxx. It must be given freely diluted. It should not be prescribed in powder with readily oxidizable or combustible substances, as when triturated with them it forms explosive compounds. As a gargle ʒss–iv in water Oj may be used.

The *troches* (*trochisci potassii chloratis*) each contain gr. v of the salt.

The other potassium preparations have been or will be considered in their appropriate place.

LITHIUM.

What are the sources of lithium?

Lithium is a chemical element, found native in the form of silicates, phosphates, etc.

What are the physiological effects and uses of the lithium salts?

The lithium salts appear to resemble those of potassium. They are eliminated by the urine as urates, increasing the urine and rendering it much more strongly alkaline than a corresponding amount of a potassium salt. As the urate of lithium is much more soluble than either the urate of sodium or of potassium, the lithium preparations are advantageously *used* in the treatment of *chronic gout* and *lithœmia*, and as a *local application* to gouty deposits either before or after the skin has broken. It has also been employed internally in *glycosuria*.

What are the preparations of lithium and their doses?

Lithii Carbonas (*lithium carbonate*), dose gr. v–x freely diluted. As a local sorbefacient for gouty deposits a solution (gr. v–f℥j) should be kept constantly applied.

Lithii Citras (*lithium citrate*), dose gr. v–xx.

Lithii Benzoas (*lithium benzoate*), dose gr. v–xx.

Lithium bromide and *L. salicylate* have been previously mentioned.

Sodii Acetas (*sodium acetate*) is supposed to possess properties similar to those of potassium acetate, and has been used for the same purposes and in the same doses.

Hydragogue Diuretics.

What are hydragogue diuretics?

The medicines of this group greatly increase the flow of the *watery* element of the urine, and are hence used in the treatment of dropsies.

Name the hydragogue diuretics.

Squill, digitalis, caffeine, apocynum, broom, dandelion, sweet spirit of nitre and mercurials.

SCILLA—SQUILL.

What is squill?

Squill is the sliced *bulb* of Urginea scilla (*Nat. Ord.* Liliaceæ) and contains *scillipicrin*, *scillitoxin* and *scillin*. In *small doses* squill increases the mucous secretions and is a stimulating expectorant, while it markedly increases the urinary secretion. In *large doses* it causes nausea, vomiting and sometimes purging, and in *excessive doses* produces in addition great abdominal pain, with scanty, bloody or even suppressed urine, great depression, collapse, convulsions and death.

Scillipicrin appears to be the diuretic principle. *Scillitoxin* slows the pulse, and in overdoses causes diastolic cardiac arrest by stimulating the peripheral vagi; after large doses the vagi are finally paralyzed and the pulse becomes rapid. *Scillin* is devoid of diuretic effects, but appears to be the emetic principle.

The *treatment of poisoning* consists of evacuating the contents of the stomach and the use of opiates and demulcents. If collapse occurs alcohol must be employed.

Squill is *used* as a *diuretic* in *dropsy*, but should not be employed if kidney disease or cystitis is present. It is frequently combined with digitalis in cardiac dropsies, and in chronic pleurisy or pericarditis is often given with calomel. As an *expectorant* it is much used in *bronchial* affections. As an *emetic* it is too dangerous a remedy to employ.

As a *diuretic* or *expectorant* squill may be given in doses of gr. j–ij repeated every 2 hours and gradually increased until nausea occurs. Doses of gr. vj–xij generally prove emetic. The dose of the *fluid extract* (*extractum scillæ fluidum*) is ♏j–ij; of the *tincture* (*tinctura scillæ*) ♏x–xxx; of the *vinegar* (*acetum scillæ*) ♏x–xxx; of the *syrup* (*syrupus scillæ*) fʒss–j; of the *compound syrup* (*syrupus scillæ compositus—Cox's hive syrup*), containing squill and senega and gr. j of tartar emetic in each ounce, ♏v–fʒj.

DIGITALIS—CAFFEINE.

Are these drugs used as diuretics?

The uses of these remedies as diuretics have already been discussed under the head of "*cardiac stimulants.*" For this purpose the best preparations of digitalis are the *infusion*, the *powdered leaves* or the *tincture*.

APOCYNUM.

What is apocynum?

Apocynum, Canadian hemp, or milk-weed, is the *root* of A. cannabinum (*Nat. Ord.* Apocynaceæ) and contains *apocynin* and *apocyneïn*, a glucoside. These substances are supposed to be cardiac tonics, acting on the heart similarly to digitalis. They are also diuretic. Apocynum is laxative in *small*, but emetic and cathartic in large doses. It is chiefly *used* as a diuretic in dropsies, and should not be given in quantities sufficient to purge when the former effect is desired; dose gr. v–xx in infusion or decoction.

SCOPARIUS.

What is scoparius?

Scoparius is the *tops* of Sarothamnus Scoparius or broom (*Nat. Ord.* Leguminosæ), and contains a volatile liquid alkaloid, *sparteine*, (*v.* "*Cardiac Stimulants*") and a neutral principle, *scoparin*, in which the diuretic properties are supposed to reside. Broom is an efficient hydragogue diuretic, and in large doses produces free purging and sometimes vomiting. It is much *used* in the treatment of *dropsies* and is best given in decoction (℥ss to water Oj boiled down to Oss, dose f℥j every 2 or 3 hours until an effect is produced), or a fluid extract (not officinal) may be given in doses of fʒss–j.

TARAXACUM.

What is taraxacum?

It is the *root* of Taraxacum Dens-leonis or dandelion (*Nat. Ord.* Compositæ) gathered in the autumn, and contains a bitter principle, *taraxacin*; also *taraxacerin*, *inulin*, resin, etc.

It is *diuretic*, laxative and slightly cholagogue, and is *used* in dropsies of hepatic origin and dyspepsia with torpor of the liver. Dose of the *extract* (*extractum taraxaci*) gr. xx–ʒj; of the *fluid extract* (*extractum taraxaci fluidum*) fʒj–ij.

SPIRITUS ÆTHERIS NITROSI—SPIRIT OF NITROUS ETHER.

Is this medicine a diuretic?

Sweet spirit of nitre is diuretic in large doses if the surface of the body is kept cool. It is usually combined with other diuretics, but may be given alone where the urinary secretion is scanty from simple congestion or from purely functional causes. It will be considered more fully under "*Diaphoretics;*" dose f℥j–iv freely diluted.

MERCURIALS.

Are the mercurial preparations ever used as diuretics?

Calomel (*q. v.*) has been employed as a diuretic in cardiac dropsy, dose gr. iss 4 or 5 times a day. It is a useful adjunct to squill in hydrothorax and hydropericardium.

Corrosive sublimate will probably prove to be a more powerful diuretic, as by its action on the liver it increases the formation of urea, which of itself always increases the excretion of water by the urine.

ALTERATIVE DIURETICS.

What are alterative diuretics?

They are medicines which are employed not only as diuretics but also for their effect on the mucous membrane of the urinary tract, by which they are possibly to some extent excreted, or on which they exercise an alterant and sedative effect during their passage in the urine.

Name the medicines belonging to this group.

Buchu, pareira, uva ursi, chimaphila, triticum, juniper, oil of erigeron, oil of santal, stigmata maydis, turpentine, copaiba, cubeb, matico, cantharides.

BUCHU. PAREIRA.

What are these medicines?

BUCHU, the *leaves* of Barosma betulina and other species (*Nat. Ord.* Rutaceæ), natives of S. Africa, contains a *volatile oil* and a *bitter principle.* It is a mild tonic and diuretic, and slightly stimulates the genito-urinary mucous membranes, having also an alterative effect upon them.

It is *used* in chronic catarrhal conditions of the genito-urinary mucous tract, as *chronic pyelitis*, *chronic cystitis* and especially in irritation of the neck of the bladder; dose of the *fluid extract* (*extractum buchu fluidum*) f℥ss–j.

PAREIRA, the *root* of Chondodendron tormentosum (*Nat. Ord.* Menispermaceæ), a Brazilian plant, contains a bitter alkaloid, *cissampeline*, and has been used with success in the treatment of *chronic cystitis*, *gleet* and "*irritable bladder.*" It is said to be also tonic and laxative. Dose of the *fluid extract* (*extractum pareiræ fluidum*) fʒss–j.

UVA URSI. CHIMAPHILA.

What are these medicines?

UVA URSI is the *leaves* of Arctostaphylos Uva ursi or bearberry (*Nat. Ord.* Ericaceæ), and contains *tannic* and *gallic acid*, a glucoside called *arbutin*, *ericolin* (a bitter substance), etc. It is used as a mild astringent tonic, and diuretic in *chronic pyelitis* and *cystitis*, and has also been employed in *chronic bronchitis.*

Arbutin is the diuretic principle, and as it is, partially at least, eliminated as hydroquinone (*vid.* "*Antipyretics*"), it is supposed to act as an antiseptic to the urogenital tract. It has been employed in the above diseases and internally in *gonorrhœa.*

Dose of the *fluid extract* (*extractum uvæ ursi fluidum*) fʒss–ij, t. d.

CHIMAPHILA, the *leaves* of C. umbellata, pipsissewa, wintergreen or ground-holly (*Nat. Ord.* Ericaceæ) contains *arbutin*, *tannic acid*, *chimaphilin*, etc., is tonic, astringent and diuretic, resembling buchu and uva ursi in its effects and uses. Special alterative qualities have been claimed for it in scrofulous affections.

Dose of the *fluid extract* (*extractum chimaphilæ fluidum*) fʒss–j, t. d.

TRITICUM.

What is triticum?

Triticum, the *rhizome* of T. repens or couch grass (*Nat. Ord.* Graminaceæ), contains *triticin* and several *sugars*, and is feebly diuretic. It is useful in cystitis and in irritation of the neck of the bladder.

Dose of the *fluid extract* (*extractum tritici fluidum*) fʒss–ij.

JUNIPERUS—JUNIPER.

What is juniper?

Juniperus (*juniper*) is the *fruit* (or berries) of J. communis (*Nat. Ord.* Coniferæ), and contains a *volatile oil* (*oleum juniperi*, dose gtt. v–xv), on which its diuretic effects depend. It is a stimulant to the kidneys, capable in overdoses of causing strangury and bloody urine, and is sometimes used as an emmenagogue. It is chiefly employed as an adjuvant to other diuretics, particularly the alkaline group. As an *alterative diuretic* it is used in *chronic pyelitis* and *chronic cystitis.* It is sometimes given in *subacute renal congestion*, but is contraindicated where active inflammation is present. It is occasionally used as a *carminative* and *stomachic.* The preparations are the *spirit* (*spiritus juniperi*), containing 3 per cent. of the oil, dose ʒj–ij; the *compound spirit* (*spiritus juniperi compositus*) contains also the oils of caraway and fennel in alcohol and water, and is about the same strength as *gin*, which is often used as a substitute for it; dose f ʒj–iv.

OLEUM ERIGERONTIS—OIL OF ERIGERON.

What is the oil of erigeron?

It is the *oil distilled* from the fresh flowering *herb* of Erigeron canadense, or Canada fleabane (*Nat. Ord.* Compositæ), and yields on distillation a *resin* and a *terpene.* It is *diuretic* and *hemostatic*, and is useful in hemorrhages due to relaxation of the genito-urinary mucous membrane. It has been used with success in *gonorrhœa;* dose gtt. v–xx on sugar or in capsule, every two or three hours.

OLEUM SANTALI—OIL OF SANTAL.

What is the oil of santal?

It is a *volatile oil* distilled from the *wood* of Santalum album (*Nat. Ord.* Santalaceæ). It is an *alterative*, *diuretic* and *blenorrhetic*, sometimes causing vertigo, when its use should be discontinued or the dose decreased. Occasionally it produces gastro-intestinal irritation. It is used in the second stage of *gonorrhœa*, and in *chronic bronchitis* it is often beneficial; dose ♏ v–xx, in emulsion or capsule, t. d.

STIGMATA MAYDIS.

What is this substance?

Stigmata maydis (not officinal) or corn silk, the *stigmata* of Zea Mays or Indian corn (*Nat. Ord.* Graminaceæ) is a mild, stimulating diuretic, and is strongly recommended in *cystitis*, both acute and chronic, in *gonorrhœa*, in *irritability of the bladder* depending upon a highly concentrated urine, in *nocturnal incontinence* in children, and even in *cardiac dropsy.* It is given in infusion, ad libitum, or in the form of fluid extract, of which the dose is fʒj–ij every hour or two.

TEREBINTHINA—TURPENTINE.

What are the officinal varieties of turpentine?

1. TEREBINTHINA (*turpentine* or *white turpentine*) is a *concrete oleoresin* obtained from Pinus australis, yellow or pitch pine, and other varieties of Pinus (*Nat. Ord.* Coniferæ) trees indigenous to the Southern States.

2. TEREBINTHINA CANADENSIS (*Canada turpentine*, *Canada balsam* or *balsam of fir*) is a *liquid oleoresin* obtained from Abies balsamea, the American silver fir, or balm of gilead tree (*Nat. Ord.* Coniferæ), found in the northern portions of N. America.

3. Unofficinal varieties known to commerce are *Chian turpentine* derived from Pistacea Terebinthinus (*Nat. Ord.* Anacardaceæ), formerly used as a specific for internal (especially uterine) cancer, but possessing no curative power; *Bordeaux turpentine*, *Venice turpentine*, etc.

What do the turpentines contain?

They contain a *resin* or rosin (*resina*) united to a *volatile oil* (*oleum terebinthinæ*).

What are the effects and uses of turpentine?

The *effects* of turpentine are those of the oil which it contains. They are rarely *used* internally, but have been given as an alterative to the broncho-pulmonary and genito-urinary mucous membranes in chronic catarrhal conditions, and have been used as an anthelmintic, but for all these purposes the oil is preferred.

Dose as a *diuretic* and *blenorrhetic* gr. xx–ʒj, in pill or emulsion; as an *anthelmintic* ℥ss–j.

RESINA (*resin*) is only used externally as a basis for plasters and ointments. Its preparations are a *cerate* (*ceratum resinæ*), sometimes called basilicon ointment, and a *plaster* (*emplastrum resinæ*), adhesive or sticking plaster.

OLEUM TEREBINTHINÆ—OIL OF TURPENTINE.

What is the oil of turpentine?

Oil of turpentine or spirit of turpentine is a *volatile oil distilled* from turpentine.

What are its effects and uses?

Locally it is rubefacient. *Internally* it is carminative, in large doses causing mental exhilaration and increasing the force and frequency of the pulse and proving cathartic. It is eliminated by the lungs and kidneys, imparting a violet-like odor to the urine. In *excessive doses* it is capable of causing death (rare). The symptoms of poisoning are unconsciousness, bloody, often suppressed urine, and rapid, feeble pulse. Vomiting and strangury or purging sometimes occur and occasionally the pupils are dilated. Small doses seem to increase the pulse rate by direct action on the *heart*, while large doses stimulate the vagi and slow the heart. Moderate doses are diuretic, but when large amounts are given renal irritation results. It is *used* as an *alterative diuretic* in *chronic cystitis*, *gleet* and *chronic pyelitis*. In *impotence* and *spermatorrhœa* depending on relaxation it is sometimes employed. In *typhoid pneumonia* and *bronchitis*, and in *hypostatic pulmonary congestion*, as in typhoid fever, it is often used externally and internally with the happiest effect. It is very useful in *ulceration of the stomach* or *intestines*, and in *typhoid fever* when the tongue becomes brown and dry or cracked, red and glazed, or when the ulcers are very slow to heal; it acts not only locally but also as a cardiac stimulant. In *hemorrhages* from the lungs, stomach or bowels, in *post-partum hemorrhages* and in *purpura hemorrhagica* it is sometimes useful. As an addition to stimulating enemata to cause the expulsion of flatus or to rouse the system to shock it is much resorted to. It is also used as an *anthelmintic.*

Locally as a counterirritant, either as a liniment or fomentation, it is much used in *bronchitis* and in *muscular rheumatism*, and in the latter manner in *peritonitis*, *hysterical abdominal pains* and in *flatulency.* Dose gtt. v–xv, 4 or 5 times daily in emulsion or capsule; as a cathartic enema or anthelmintic f℥ss–j may be given. Externally a *liniment* (*linimentum terebinthinæ*) is employed, or the oil may be used either full strength or diluted with sweet oil. A saturated solution of camphor in oil of turpentine is a good rubefacient liniment.

COPAIBA.

What is copaiba?

Copaiba is an *oleoresin* obtained from Copaifera Langsdorffii and other species (*Nat. Ord.* Leguminosæ), trees of S. America. It is cathartic, and sometimes emetic, in large doses, slightly stimulates the circulation and acts as an alterative blennorrhetic on the mucous membranes by which it is excreted. After large doses, a resinous precipitate will occur if nitric acid be added to the urine, which, however, is soluble in alcohol. When the *resin* is taken in considerable quantities, the urine responds to the copper tests for sugar. Copaiba is chiefly eliminated by the genito-urinary mucous membranes and to a slight extent by the lungs. Its use is sometimes followed by urticaria. It is *used* in *chronic genito-urinary inflammations*, especially in *gonorrhœa* after the subsidence of the acute stage. In *bronchorrhœa* it is sometimes employed. The *oil* has been lauded as a hydragogue diuretic in dropsies when not of renal origin. The *dose* of *copaiba* is gtt. x–xx or more in emulsion, pill or capsule. The *mass* (*massa copaibæ*) contains 94 per cent. with magnesia; of the *oil* (*oleum copaibæ*) the dose is gtt. v–xv in emulsion or capsule.

CUBEBA—CUBEB.

What is cubeb?

Cubeb is the *unripe fruit* of Cubeba officinalis (*Nat. Ord.* Piperaceæ), an East Indian plant. It contains a *volatile oil*, a neutral principle (*cubebin*) and *cubebic acid*. Cubeb is diuretic and carminative, slightly accelerating the pulse. In large doses it often causes vomiting and purging. It is eliminated by the mucous membranes and urine, increasing the excretion of uric acid. Its use is sometimes followed by urticaria. The addition of nitric acid to the urine after the use of cubeb produces a resinous precipitate.

It is *used* in *gonorrhœa* and is less apt than copaiba to disorder the digestion. It is also used in *bronchitis*, and has been smoked in cigarettes to relieve *sore throat* and *hoarseness*. The powder, used as a snuff, is employed in *coryza*. The *dose* of powdered cubeb is ʒss–iij; of the *oil* (*oleum cubebæ*) gtt. x–xv gradually increased. It is not as efficacious as the *oleoresin* (*oleoresina cubebæ*), dose ♏v–xxx given in emulsion. Of the *tincture* (*tinctura cubebæ*) the dose is f℥j–ij; of the *fluid extract* (*extractum cubebæ fluidum*) f℥ss–j. The troches (*trochisci cubebæ*) each contain gr. ss of the oleoresin.

MATICO.

What is matico?

Matico is the *leaves* of Artanthe elongata (*Nat. Ord.* Piperaceæ), a shrub of Peru. It contains a *volatile oil*, *resin*, *artanthic* and *tannic acid*, etc. It is *used* as an *alterative blennorrhetic* in *gonorrhœa*, as a *hæmostatic* in *internal hemorrhages*, and locally as a *styptic*. Dose of the *fluid extract* (*extractum matico*) f℥ss–j; of the *tincture* (*tinctura matico*) f℥i–ij.

CANTHARIS—CANTHARIDES.

Is cantharides used as an alterative diuretic?

Cantharides is an intense stimulant and irritant to the kidneys, being diuretic in small doses, and frequently causing strangury, priapism and bloody urine. It is sometimes used in *gleet*, and in spermatorrhœa and impotence from weakness. It will be noticed at length under "*Epispastics.*" Dose of the *tincture* (*tinctura cantharidis*) gtt. v–x t. d.

ORDER II.—DIAPHORETICS.

What are diaphoretics?

Diaphoretics are medicines which increase the secretion of sweat, either by (1), stimulating the secretory nerve fibres in the glands; (2) stimulating the nerve centre governing the secretion of sweat; or (3) relaxing the skin, dilating the blood vessels and regulating the force of the circulation.

For what purposes are they used and how are they classified?

They are used (1) to abort an oncoming disease (as a catarrh or inflammation of mucous or serous membranes after exposure to cold) or aid in its subsidence (as in the paroxysm of a malarial fever); (2) to aid absorption, as in dropsies, and (3) to eliminate poisons from the blood.

They are divided into Nauseating, Sedative, Saline and Special Diaphoretics.

NAUSEATING DIAPHORETICS.

What are the nauseating diaphoretics?

The act of emesis is accompanied by general relaxation and diaphoresis, and even in nausea a more or less pronounced perspiration occurs. Any of the emetics in doses just sufficient to nauseate will produce this effect, but the only one which is in general use for this purpose is IPECAC (v. "*Emetics*"), which is used either alone (in doses of gr. ss–j every two hours) or combined with opium in the form of DOVER'S POWDER (*v.* "*Opium*") in the early stages of *inflammations*, in "*cold*," in *muscular rheumatism* and in acute *suppression of the menses* to break up the train of morbid symptoms.

SEDATIVE DIAPHORETICS.

What are sedative diaphoretics?

When the circulation is much excited, as in fevers and inflammations generally, medicines which tend to reduce the force and rapidity of the circulation and to lower the temperature, act as diaphoretics. Many of these agents (particularly *antimonials*, *aconite* and *veratrum viride*) tend to nauseate or even to cause vomiting when given in full doses. In *sthenic inflammations* the ANTIMONIAL PREPARATIONS (*q. v.*) especially if combined with minute doses of morphine are often very efficacious, and may be used in the *early stages* of *laryngitis* and *bronchitis* and in combination with other remedies in fever. ACONITE and VERATRUM VIRIDE are also sometimes resorted to in the early stages of sthenic inflammations for their combined sedative and sudorific effect. In this group also should be placed SALICYLIC ACID and other ANTIPYRETICS (*q. v.*) which produce more or less profuse perspiration.

SALINE DIAPHORETICS.

What are the saline diaphoretics?

While some of the saline diaphoretics have a sedative effect upon the circulation, which is not, however, as marked as the remedies of the preceding group, they have no tendency to nauseate even when given in large doses, on the contrary, they are acceptable to the stomach, and form the basis of most fever mixtures.

POTASSIUM CITRATE and its preparations have been noticed among the "*Diuretics.*"

LIQUOR AMMONII ACETATIS—SOLUTION OF AMMONIUM ACETATE.

What is the solution of ammonium acetate?

The *solution of ammonium acetate* or *spirit of mindererus* is a mild stimulant, diaphoretic and diuretic, often employed in febrile and inflammatory affections combined with other remedies. Dose f℥ss–j.

SPIRITUS ÆTHERIS NITROSI—SPIRIT OF NITROUS ETHER.

What is this substance?

Spirit of nitrous ether, or *sweet spirit of nitre*, is a solution of 5 per cent. of nitrous ether (ethyl nitrite) in alcohol. In *small doses* it is a diaphoretic and stimulant, in *larger doses* an antispasmodic, and (if the skin be kept cool) diuretic; in *excessive doses*, either internally or when inhaled, it is a depresso-motor, acting similarly to the other nitrites (*q. v.*) and capable of causing death. It is much *used* as a diaphoretic in *fevers*, and occasionally as a diuretic (*q. v.*) and antispasmodic in nervous children. *Dose* for an *adult* fℨj–iv. It is given as a diaphoretic in minute doses, frequently repeated and largely diluted, the body being kept warm.

SPECIAL DIAPHORETICS.

PILOCARPUS.

What is pilocarpus?

Pilocarpus is the *leaflets* of P. pennatifolius, or jaborandi (*Nat. Ord.* Rutaceæ), a Brazilian shrub.

What are its chief chemical constituents?

It contains an alkaloid, *pilocarpine*, and a *volatile oil*; a second alkaloid, *jaborine*, probably a derivative of pilocarpine, has been isolated, and lately two other derivative alkaloids *pilocarpidine* and *jaborandine* have been described.

What are the physiological effects of these substances?

In *medicinal doses pilocarpus* or *pilocarpine* produces profuse diaphoresis and salivation, sometimes copious, with flushed face and quickened circulation and respiration. Sometimes the mucous secretions are increased also, and nausea, even vomiting, may occur. It increases both the watery portion and the solids (especially urea) of the *perspiration* by a direct influence on the nerve endings governing its secretion, and probably increases the secretion of the *gastric juices* and *bronchial mucus* in the same manner. It appears to act directly as a stimulant upon the cells of the salivary glands. There seems to be some relation between its influence over the secretions of perspiration and saliva, the one being more profuse when the other is scanty, and *vice versâ*. In small doses frequently repeated it proves diuretic. It seems to stimulate the nutrition of the hair. The cardiac action is at first quickened, but soon slowed, and the arterial tension is elevated. Applied to the eye it contracts the pupil (by peripheral action) and increases the tension of accommodation. *Pilocarpine* and *atropine* are antagonists as regards their action on the heart, intestines and pupil, and on the secretions of perspiration and saliva. *Jaborine* acts upon the heart, pupil, intestines and salivary glands like atropine. *Pilocarpidine* causes profuse diaphoresis, salivation, vomiting and purging; while *jaborandine* resembles atropine in its cardiac effects.

What are the medicinal uses of pilocarpus and its alkaloid?

Pilocarpus or pilocarpine is used as a *diaphoretic* to abort disease in incipient catarrh and at the onset of a paroxysm of malarial fever; in various forms of *dropsy*, to aid in removal of the fluid, especially *hydrothorax*, and in *pulmonary œdema*; in *uræmia*, to eliminate the poison from the blood, it is of great value, and similarly in *acute* or *chronic Bright's disease*, to relieve the kidneys of some of their work, it is very useful. It is also employed in *subacute* and *muscular rheumatism*.

As a *diuretic*, minute doses (pilocarpine gr. $\frac{1}{12}$) are given in acute *suppression of urine*, but when thus used in the early stages of acute desquamative nephritis, it must be employed with great caution. As an *expectorant* it has been given in *bronchitis* and asthma and, without much success, in croup and diphtheria. To stimulate the growth of hair in *alopecia*, pilocarpine may be administered internally or hypodermically, and applied locally as well, and it has been employed hypodermically with success to arrest severe and prolonged hiccough.

It should *not be given* in diseases of the gastro-intestinal mucous membrane, nor in weak heart due to cardiac disease.

What are the officinal preparations of pilocarpus and their doses?

EXTRACTUM PILOCARPI FLUIDUM (*fluid extract of pilocarpus*), dose fʒss–j.

PILOCARPINÆ HYDROCHLORAS (*pilocarpine hydrochlorate*), dose gr. ⅛–ss. It is well adapted to hypodermic use.

ORDER III.—EXPECTORANTS.

What are expectorants?

Expectorants are remedies which are given to modify the secretions of, and promote their expulsion from, the air passages.

How may they be classified?

They are divided into sedative and stimulating expectorants?

SEDATIVE EXPECTORANTS.

What are sedative expectorants?

They are remedies which increase the secretion and at the same time tend to lower the blood pressure, cause nausea and, if frequently repeated, vomiting.

Name the sedative expectorants.

Ipecac, apomorphine, tartar emetic, pilocarpine, lobelia and grindelia. Of these ipecac and apomorphine have been discussed with the "*emetics*," tartar emetic with the "*sedatives*," pilocarpine with the "*diaphoretics*," and lobelia with the "*depresso-motors*."

GRINDELIA.

What is grindelia?

Grindelia is the *leaves* and *flowering tops* of G. robusta (*Nat. Ord.* Compositæ). It appears to depress the motor nerves and muscles, and in large doses to slow the heart and reduce the blood pressure. Toxic doses produce narcosis with dilated pupils. It is eliminated by the kidneys, increasing the flow of urine, and to some extent by the broncho-pulmonary mucous membrane. It has been highly recommended in *spasmodic* and *cardiac asthma*, in *hay asthma* and *hay fever*, in *whooping cough* and in *acute* and *chronic bronchitis*. In *chronic cystitis* it has been advantageously employed, and as a *local* application in *vaginitis* and in *poisoning* by rhus toxicodendron, has met with some success. Dose of the *fluid extract* (*extractum grindeliæ fluidum*) ♏x–f ʒj.

STIMULATING EXPECTORANTS.

What are stimulating expectorants?

They are remedies which probably modify the secretion by toning up the broncho-pulmonary mucous membrane through which they are eliminated. Most of them seem to exert an alterative effect in passing through the membrane, and many of them elevate the arterial tension.

Name the stimulating expectorants.

Ammonium chloride, senega, quillaia, garlic, sanguinaria, galbanum, ammoniac, benzoin, Peruvian balsam, balsam of Tolu, squill, eucalyptus, serpentaria, turpentine, tar and terebene.

AMMONII CHLORIDUM—AMMONIUM CHLORIDE.

What is ammonium chloride?

Ammonium chloride, called also *ammonium muriate* or *sal ammoniac*, is a crystalline salt obtained from gas liquor.

What are its effects and uses?

Locally it is irritant. In medicinal doses it is believed to influence especially the mucous membranes, promoting very decidedly nutritive changes and hastening epithelial exfoliation. When given continuously for a length of time it diminishes the solids of the blood and stimulates the secretions. It is supposed to stimulate the hepatic functions, for the amount of urea excreted is greatly increased, as are all the other solids of the urine except uric acid. Large doses are purgative. It is used as a *stimulating* and *alterative expectorant* in the moist stage of *acute* and in *chronic bronchitis*, in *pneumonia* and the various *catarrhs* of children. Abroad it is employed also in *gastric* and *intestinal catarrhs*, in *chronic hepatitis* and in the early stages of *hepatic cirrhosis*. In cases of *albuminoid liver*, *spleen* or *kidneys* it is very useful. In subacute *muscular rheumatism* and in *neuralgia*, especially ovarian, it is advantageous, and it has been used internally as an alterative and employed locally as a sorbefacient in scrofulous *adenitis* of *the cervical glands*, and *uterine fibroid tumors*.

Dose gr. x–xxx. The unpleasant taste may be partially disguised by liquorice. The *troches* (*trochisci ammonii chloridi*) each contain gr. ij of the salt.

SENEGA.

What is senega?

Senega is the *root* of Polygala Senega or senega snake-root (*Nat. Ord.* Polygalaceæ) and contains *polygalic acid* or *senegin*, a glucoside identical with *saponin*.

What are its effects and uses?

Locally, it is an irritant. *Internally*, it stimulates the mucous membranes, and in large doses is emetic and cathartic. It is given as a *stimulating expectorant* in the latter stages of acute and in subacute and chronic *bronchitis*, especially when the mucous membranes are wanting in tone. It has also been used as an *emmenagogue* in *amenorrhœa* and as a *diuretic* in dropsies. Dose of the *abstract* (*abstractum senegæ*), gr. v–xx; of *the fluid extract* (*extractum senegæ fluidum*) ♏x–xx; of the *syrup* (*syrupus senegæ*) fʒj–ij. It is an ingredient of the *compound syrup of squill.*

QUILLAIA.

What is quillaia?

Quillaia or soap-bark is the *bark* of Q. Saponaria (*Nat. Ord.* Rosaceæ), a S. American tree, containing *saponin*, which foams like soap when in infusion. *Locally*, *saponin* is an irritant and protoplasmic poison. Given *internally* in sufficient doses it is a nerve and muscle poison, and completely antagonizes the effects of digitalis on the heart, which it paralyzes in diastole. It increases the secretion of bronchial mucus. Quillaia has been *used* as an *expectorant* in *chronic bronchitis*, *emphysema* and *dilated bronchi*. It is also used to aid in emulsifying oils. Dose gr. x–xxx in infusion t. d.

ALLIUM—GARLIC.

What is garlic?

Garlic is the *bulb* of Allium sativum (*Nat. Ord.* Liliaceæ) and contains a very volatile *oil.* *Locally* applied it is a rubefacient. Taken *internally* it is a condiment, stimulating digestion, increasing the secretions generally, especially the broncho-pulmonary, and quickening the circulation. It is *used* as a *stimulating expectorant* in subacute and chronic *bronchitis* and in *acute bronchitis of infants*, especially when the disease begins to assume the capillary form. Externally it is used as a counter-irritant in the above diseases, and in infantile convulsions, applied to the spine, legs and feet in the form of a poultice. Dose of the *syrup* (*syrupus allii*) fʒj for a child.

SANGUINARIA.

What is sanguinaria?

Sanguinaria or blood-root, the *rhizome* of S. canadensis (*Nat. Ord.* Papaveraceæ), contains an alkaloid, *sanguinarine.* It is a *local* irritant. *Large doses* cause vomiting with great depression, a slow, irregular pulse (from direct action on the heart) and lowered blood-pressure, dilated pupil, collapse and death from paralysis of the respiratory centre, sometimes preceded by convulsions of spinal origin and lowered reflex activity. *Moderate doses* increase the arterial pressure from stimulation of the vaso-motor centres, which are paralyzed by larger doses. It stimulates the liver, the mucous membranes and the salivary and intestinal glands. It is used chiefly as a *stimulating expectorant* in lingering cases of *bronchitis.* Dose of the *tincture* (*tinctura sanguinariæ*) ♏v–xxx; of the *fluid extract* (*extractum sanguinariæ fluidum*) ♏ij–v; of the *vinegar* (*acetum sanguinariæ*) ♏v–xxx. *Sanguinarine* (not officinal) has also been used as an expectorant in the dose of gr. $\frac{1}{12}$–$\frac{1}{8}$.

GALBANUM.

What is galbanum?

Galbanum is a *gum-resin* obtained from Ferula galbaniflua and other species of F. (*Nat. Ord.* Umbelliferæ), and consists of a *gum-resin* united to a *volatile oil.* Its effects are said to resemble those of asafetida, but it possesses little antispasmodic power and is principally used in combination with other medicines as a *stimulating* *expectorant*, to lessen secretion in bronchorrhœa, and locally as a *rubefacient*. The *compound pills* (*pilulæ galbani compositæ*) contain also myrrh and asafetida and are occasionally used as an antispasmodic and emmenagogue; dose No. iij–v. The *plaster* (*emplastrum galbani*) is used locally.

AMMONIACUM—AMMONIAC.

What is ammoniac?

Ammoniac is a *gum-resinous exudation* obtained from Dorema ammoniacum (*Nat. Ord.* Umbelliferæ). It is used internally as a *stimulating expectorant* in *chronic bronchitis* and in bronchorrhœa, and locally as a *counterirritant*. Dose gr. x–xxx; of the *mixture* (*mistura ammoniaci*) f℥ss. Two *plasters* are officinal (*emplastrum ammoniaci* and *emplastrum ammoniaci cum hydrargyrô—plaster of ammoniac with mercury*).

BENZOINUM—BENZOIN.

What is benzoin?

Benzoin, a *balsamic resin* obtained from Styrax benzoin, or Benjamin tree (*Nat. Ord.* Styraceæ) contains *benzoic acid*, *resin*, *volatile oil*, and often *cinnamic acid*.

The effects of benzoin are due to *benzoic acid* (*v.* "*Antiseptics*"). *Locally* it is an irritant. Internally it stimulates the broncho-pulmonary and genito-urinary mucous membrane. It is eliminated chiefly by the urine as hippuric acid, increasing the acidity of that excretion.

It is chiefly *used* by inhalation (compound tincture ʒj, in a cupful of boiling water,) in *laryngitis*, or to quiet spasmodic laryngeal cough, as in influenza. It has also been employed internally in *chronic bronchitis* and in chronic cystitis with alkaline urine and phosphatic deposits, but for the latter purpose benzoic acid or its salts are preferred. It is added to ointments, to prevent rancidity, and is much employed in the form of fumigating pastiles. Dose of the *tincture* (*tinctura benzoini*) fʒss–j; of the *compound tincture* (*tinctura benzoini composita*) fʒss–ij.

Benzoinated lard (*adeps benzoinatus*) contains 2 per cent. of benzoin.

BALSAMUM PERUVIANUM—BALSAM OF PERU. BALSAMUM TOLUTANUM—BALSAM OF TOLU.

What are these substances?

Balsam of Peru is a *balsam* obtained from Myroxylon Pereiræ (*Nat. Ord.* Leguminosæ) and contains *cinnamein*, *resin*, *benzalcohol*, *benzylic benzoate*, *stilbene* and *cinnamic* and *benzoic acids.*

It is a stimulant and tonic to the mucous membranes, and has been used in various catarrhs. Dose fʒss in emulsion.

Balsam of Tolu is a *balsam* obtained from Myroxylon toluifera (*Nat. Ord.* Leguminosæ) and contains *resins*, *benzylic benzoate* and *cinnamate*, *tolene*, and *cinnamic* and *benzoic acids.* Its effects and uses are similar to those of balsam of Peru, to which it is preferred because of its more pleasant taste. Dose gr. x–xxx in emulsion, every few hours. It is, however, principally used as a vehicle. Dose of the *tincture* (*tinctura tolutani*) is fʒj–ij; of the *syrup* (*syrupus tolutanus*) fʒj–iv.

PIX LIQUIDA—TAR.

What is tar?

Tar is an *empyreumatic oleoresin* obtained by destructive distillation of the wood of Pinus palustris and other species of P. (*Nat. Ord.* Coniferæ). When distilled it yields *pyroligneous acid*, *oil of tar*, and a black residuum known as *pitch.* The oil of tar contains *creasote.* Tar resembles turpentine in its effects on the mucous membranes, but is more antiseptic. Externally it is an irritant. It is used as a *stimulating expectorant* in the latter stages of *acute bronchitis*, particularly where the disease does not yield readily to other treatment, and in *chronic bronchitis. Externally* it is employed in *chronic skin diseases*, especially in squamous affections.

Tar-water (not officinal) may be given in doses of f℥ss–j, or the syrup (*syrupus picis liquidæ*), which is better, in doses of f℥ss. *Locally*, the *oil* (*oleum picis liquidæ*) is used as a substitute for "oil of cade," which is of uncertain strength, or the *ointment* (*unguentum picis liquidæ*) may be applied.

What substances are often used as expectorants which have been previously considered in other medicinal groups?

Squill and turpentine (*v.* "*Diuretics*"), eucalyptus, serpentaria and Prunus Virginiana (*v.* "*Aromatic Bitters*").

TEREBENE.

What is terebene?

Terebene (not officinal) is a derivative of turpentine, prepared by gradually adding sulphuric acid to the oil of turpentine. It is a good *stimulating expectorant*, very useful in the declining stages of *acute* and in *chronic bronchitis*. It has also been employed in flatulent dyspepsia and genito-urinary inflammations. Dose ♏ v–xx in capsule or emulsion t. d., or its vapor may be inhaled diluted with steam.

ORDER IV.—ASTRINGENTS.

What are astringents?

Astringents are remedies employed to cause contraction of the tissues with which they come in contact and thus lessen secretion.

For what purposes are they used?

They are used to check profuse secretion (*e. g.*, ptyalism, etc.) or morbid discharges (*e. g.*, diarrhœa), to overcome relaxation of the tissues, and as hæmostatics and styptics.

How may the astringents be classified?

They are divided into vegetable and mineral astringents.

VEGETABLE ASTRINGENTS.

What are the vegetable astringents?

They are tannic and gallic acids, and the various plants which are used as astringents on account of containing these principles.

Name the vegetable astringents.

Tannic acid, gallic acid, nutgalls, catechu, kino, krameria, hæmatoxylon, white-oak, geranium, witch-hazel, red and white rose, sumach, chestnut leaves.

ACIDUM TANNICUM—TANNIC ACID.

What is tannic acid?

Tannic acid is widely distributed throughout the vegetable kingdom and exists under two forms, *gallo-tannic acid* (which is the officinal variety and strikes a blue-black color with the ferric salts) and *kino-tannic acid* (which produces a greenish-black color with the same salts). Gallo-tannic acid is usually obtained from nutgall by the action of washed ether.

What are its physiological effects?

Tannic acid is a powerful astringent, coagulating albumins, contracting blood-vessels and constringing tissues with which it comes in contact. It checks the secretions of the alimentary canal when taken internally, and restrains peristalsis, thus tending to constipate. It is converted into an alkaline tannate and into gallic acid in the prima via and slowly absorbed. It is eliminated by the fæces and urine under its own form and as gallic and pyrogallic acids.

For what purposes is it used in medicine?

When *remote* astringent effects are desired gallic acid is preferable, but tannic acid is employed whenever the part to be acted on is so situated that the drug can come in direct contact with it. Thus, it is given to *arrest morbid discharges* from the bowels in *diarrhœa* and *dysentery*, both internally and by enema, and is used externally for the same purpose in *leucorrhœa*, *gleet*, *colliquative sweating*, and as an application to *chronic ulcers*. To *counteract relaxation of tissues* it is employed in the treatment of *spongy gums*, *chronic pharyngitis* and *laryngitis*, *mercurial stomatitis* and hemorrhoids. It is used also to *arrest hemorrhages* from the nose, gums, pharynx, stomach and bowels, and locally as a styptic; to *harden tissues* subjected to pressure, as in threatened bed-sores and tender feet, and as an *antidote* to *antimony* and other metallic poisons.

Dose, in diarrhœa, gr. j–xv in pill; in hemorrhage, gr. v–xx in powder. The *troches* (*trochisci acidi tannici*) each contain gr. j, and may be used in relaxed palate or sore throat.

The *ointment* (*unguentum acidi tannici*) or a solution in glycerin may be used locally.

ACIDUM GALLICUM—GALLIC ACID.

What is gallic acid?

Gallic acid is tannic acid + a molecule of water. It does not coagulate albumin, and hence is not as efficacious as a local astringent, but is preferred when it is desirable that the astringent should be absorbed and act through the blood on some remote part. It is used as a *hemostatic* in *hemoptysis*, *hematuria* and *uterine hemorrhage*.

It is also employed to *lessen secretion*, as in *colliquative sweats* and *bronchorrhœa*, and to *check morbid discharges* as in *chronic albuminuria*. Dose gr. v–xxx, in powder, pill or solution. An *ointment* (*unguentum acidi gallici*) is used locally.

Describe the preparations, doses, and uses of the vegetable astringents which owe their virtues to tannic and gallic acids?

Galla (*nutgall*) is an *excrescence* found on Quercus lusitanica, *var.* infectoria, the gall oak (*Nat. Ord.* Cupuliferæ) produced by the puncture and deposit of the ova of a fly (cynips quercûs folii or diplolepis gallæ tinctoriæ). Before the maturity of the larvæ and their escape from the gall, they contain *tannic acid* (50–60 per cent.) and *gallic acid* (3 per cent.), afterward they are much inferior and contain comparatively little of these substances.

They are but little used except as the source of tannic and gallic acids. The *tincture* (*tinctura gallæ*) is chiefly used as a chemical test. The *ointment* (*unguentum gallæ*) is sometimes applied to hemorrhoids, combined with powdered opium.

Catechu, an *extract* of the *wood* of Acacia Catechu (*Nat. Ord.* Leguminosæ); contains *kino-tannic* and *catechuic acids* (*catechin*). It is a powerful astringent, much used in *diarrhœas* and to some extent in *hemorrhages*, and locally as an *astringent* in sore throat, as an injection in *gonorrhœa* and *leucorrhœa*, and as a *styptic*. Dose gr. x–xxx in emulsion or capsules. Of the *compound tincture* (*tinctura catechu composita*) f ʒj–iij may be given. The *troches* (*trochisci catechu*) each contain gr. j.

Kino, the *inspissated juice* of Pterocarpus Marsupium (*Nat. Ord.* Leguminosæ) and other trees; contains *kino-tannic acid*, *kinoïn*, *pyrocatechin*, etc., and has similar properties and uses to catechu. Dose of the powder gr. x–xxx; of the *tincture* (*tinctura kino*) f ʒj–ij.

Krameria, the *root* of K. triandra and K. tomentosa (*Nat. Ord.* Polygalaceæ), S. American shrubs; contains *kramero-tannic acid* and is a powerful astringent, similar to kino and catechu. Dose of the *extract* (*extractum krameriæ*) gr. v–xv; of the *fluid extract* (*extractum krameriæ fluidum*) f℥ss–j; of the *tincture* (*tinctura krameriæ*) f℥ss–ij; of the *syrup* (*syrupus krameriæ*) f℥j–iv. The *troches* (*trochisci krameriæ*) each contain gr. ij.

HÆMATOXYLON, logwood or Campeachy wood, is the *heart wood* of H. campeachianum (*Nat. Ord.* Leguminosæ), containing *tannic acid*, *hæmatoxylin*, etc. It is a good astringent in diarrhœas due to relaxation, especially in children, but the discharges will stain the linen blood-red. Of the *extract* (*extractum hæmatoxyli*) the dose is gr. x–xxx.

QUERCUS ALBA, or white oak (*Nat. Ord.* Cupuliferæ). The *inner bark* is officinal, and contains *querci-tannic acid*. It is occasionally used in *diarrhœas*, but more often as an enema in *hemorrhoids* and *prolapsus ani*, or as a vaginal wash in *leucorrhœa* or relaxed conditions with tendency to cystocele or rectocele. It makes an indelible stain on linen.

GERANIUM, the *rhizome* of G. maculatum, crow's foot or crane's bill (*Nat. Ord.* Geraniaceæ); contains *tannic* and *gallic acids*, and is an efficient indigenous astringent. Dose of the *fluid extract* (*extractum geranii fluidum*) f℥ss–j.

HAMAMELIS, the *leaves* of H. virginica or witch hazel (*Nat. Ord.* Hamamelaceæ); contains *tannic acid* and a *bitter principle*. It is an astringent and seems to contract the veins of the skin and mucous membranes. It has been used in passive hemorrhages as a hemostatic, as an astringent enema in hemorrhoids, and locally in congestions and inflammations. Dose of the *fluid extract* (*extractum hamamelidis fluidum*) f℥ss–j.

ROSA GALLICA (*red rose*); ROSA CENTIFOLIA (*pale rose*), (*Nat. Ord.* Rosaceæ). Their *petals* are officinal. The former is a very mild astringent, but they are principally used as flavoring ingredients and vehicles. The preparations of red rose are a *fluid extract* (*extractum rosæ fluidum*), a *honey* (*mel rosæ*), a *syrup* (*syrupus rosæ*) and a *confection* (*confectio rosæ*); those of pale rose are a *water* (*aqua rosæ*) and an *ointment* (*unguentum aquæ rosæ—cold cream*).

RHUS GLABRA (*sumach*) (*Nat. Ord.* Terebinthaceæ). The *fruit* is officinal. It is a good astringent in sore mouth and pharyngitis. The *fluid extract* (*extractum rhoïs glabræ fluidum*) may be diluted with two or more parts of water and used as a gargle.

CASTANEA, the *leaves* of C. vesca or chestnut (*Nat. Ord.* Cupuliferæ), are astringent and are supposed to possess antispasmodic properties. They are chiefly used in whooping cough. Dose of the *fluid extract* (*extractum castaneæ fluidum*) f℥ss–ij.

MINERAL ASTRINGENTS.

Name the mineral astringents.

Most of the metallic salts possess astringent properties, but those especially used for this purpose are the lead salts; alum; aluminium sulphate; the salts of copper, of zinc, of silver, and of bismuth; and cerium oxalate.

PLUMBUM—LEAD.

What is the source of lead?

Lead is obtained by roasting *galena*, the native sulphide.

What are its physiological actions?

Metallic lead is inert, as are probably also the *sulphide* and *sulphate*. *All other salts of lead*, when *applied locally* in solution, are astringent, or if the solution be strong, irritant. In medicinal doses they are astringent to the alimentary canal, decreasing its secretions and also the secretion of bile. They are but slowly absorbed. When taken for some time they reduce the volume and frequency of the pulse by stimulation of the cardio-inhibitory centre and the peripheral filaments of the vagi. They are *eliminated* by the liver and kidneys.

What are its toxicological actions?

In large doses several of the lead salts are capable of causing *acute poisoning*, the symptoms being intense gastro-intestinal irritation, vomiting, coma, paralysis and collapse.

Chronic poisoning is caused by saturation of the system with lead, either by drinking pure water conveyed in lead pipes (the contained air forming a soluble oxide), constantly eating substances adulterated with lead salts, exposure in lead factories, etc. *Lead colic* (or painters' colic), the most common form, consists of sharp pains about the umbilicus, obstinate constipation, hard, contracted abdomen, and often nausea and vomiting. This is probably due to intense stimulation of the intestinal ganglia by the lead, causing arrest of peristalsis and spasm of the muscular coat of the bowel. It is quickly relieved by belladonna, atropine or pilocarpine. Sometimes the poisoning takes the form of *lead-arthralgia*, manifesting itself by severe pain in the joints and limbs, and cramps.

Lead paralysis is loss of voluntary motion in groups of muscles, particularly the flexors of the upper extremity, causing *wrist-drop.* Electro-muscular contractility is affected, the muscles waste, and often anæsthesia of the affected or opposite side is present. The poison may also affect the brain, kidney, or other organs. An important symptom of lead poisoning is a *blue line upon the gums where they join the teeth*, and in case of doubt lead may be detected in the urine by the chemical tests.

What are the tests for lead, and how should saturnine poisoning be treated?

Sulphuretted hydrogen gives a *black*, and a solution of *potassium iodide* a *yellow precipitate* with soluble lead salts. The *treatment* of *acute poisoning* consists in evacuating the contents of the stomach, and administering diluted sulphuric acid, or sodium or magnesium sulphate as a chemical antidote. In *chronic poisoning*, discover its source and remove it (in the case of painters, insist on scrupulous cleanliness of the hands and nails, and the use of very diluted sulphuric acid as a drink); give purgatives to overcome the resulting constipation; give diluted sulphuric acid or the soluble sulphates, with baths of potassium sulphide as antidotes, and aid elimination by large quantities of diluents and potassium iodide. In *lead colic* atropine is of service, and in *lead palsies* electricity (the faradaic current when the muscles respond) and strychnine are advantageously employed.

For what medicinal purposes are the lead salts used?

They are used *internally* as *astringents* in *diarrhœas* and *dysenteries*, as *hemostatics*, and in the treatment of *internal ane*[illegible] Locally, as *astringent injections* in *leucorrhœa* as *sedative* and *astringent lotions* in *inflammations.* The *acetate* is the only lead salt which is administered internally.

What are the preparations of lead and their uses?

Plumbi Oxidum (*lead oxide*), or litharge, is occasionally used as a dusting powder for ulcers, but is chiefly employed to make a *plaster* (*emplastrum plumbi*), which is the basis for most officinal plasters; *diachylon ointment* (*unguentum diachylon*), useful in skin diseases, and *soap-plaster* (*emplastrum saponis*).

Plumbi Acetas (*lead acetate*), or *sugar of lead*, is used *internally* as an *astringent* in *diarrhœa*, often combined with opium, and is also useful in *dysentery.* To lessen the expectoration in *chronic bronchitis* and to check the *night sweats of phthisis* it is sometimes given. As a *hemostatic* in yellow fever it does some good, and perhaps also in *hemoptysis.* It has been employed as a *sedative* in the treatment of internal *aneurism. Locally* as a *sedative* and *astringent* lotion it is much used in inflammations (not applicable to ocular therapeutics, as it may cause corneal opacity), and to check morbid discharges. Dose gr. j–viij two or three times a day. As an injection in gonorrhœa gr. ss–ij–f℥j; as a lotion in inflammation gr. v–x–f℥j.

Liquor Plumbi Subacetatis (*solution of lead subacetate—Goulard's extract*) is used externally and in the preparation of *lead water* (*liquor plumbi subacetatis dilutus—diluted solution of lead subacetate*), which contains 3 per cent. of the stronger solution, *Goulard's cerate* (*ceratum plumbi subacetatis—cerate of lead subacetate*) and a *liniment* (*linimentum plumbi subacetatis*).

Plumbi Iodidum (*lead iodide*). It may be used internally, dose gr. ij–iij, but is chiefly employed externally in the form of *ointment* (*unguentum plumbi iodidi*), which contains 10 per cent. of the salt.

Plumbi Nitras (*lead nitrate*) is used as a disinfectant (*Ledoyen's disinfecting fluid* contains ʒj to the f℥j), astringent and sedative, in wounds, ulcers, cracked nipples, onychia maligna, etc.

Plumbi Carbonas (*lead carbonate—white lead*) is used chiefly as an application to *fresh burns.* If applied to a large surface, care should be taken to guard against poisoning. An *ointment* (*unguentum plumbi carbonatis*) is officinal.

ALUMEN—ALUM.

What is alum?

Officinal *alum* is a double sulphate of aluminium and potassium. There are other varieties in which potassium is replaced by some other base, as ammonium or sodium.

What are its effects and uses?

Alum is a powerful astringent, and in large quantity an irritant, whether used locally or internally. In large doses it is emetic, and in excessive doses has caused death from gastro-intestinal irritation. It is *used* in solution as an *astringent*, by atomization in *bronchorrhœa*, by injection in *leucorrhœa*, *gonorrhœa* and *gleet*, as a gargle in *sore-throat*, *relaxed palate* and *uvula*, as a lotion in *conjunctivitis* and on cotton as a tampon in *cystocele*, *rectocele* and *uterine prolapse*. As a *hemostatic* in *hemoptysis*, a saturated solution may be used by atomization; and as a *styptic* (*aqua pagliari* consists of alum, compound tincture of benzoin and water boiled together) it is employed locally to arrest hemorrhage. As an *emetic* it is used in *croup* in *capillary bronchitis* and as an adjuvant to other emetics. It is also efficient in the treatment of *lead colic*. Dose as an *astringent* gr. x–xxx; as an *emetic* ʒj–iv. In lead poisoning a teaspoonful may be given every 3 or 4 hours.

Dried Alum (*alumen exsiccatum*) is alum deprived of its water of crystallization by heat. In excessive doses it has proved fatal. Dose gr. v–x. Externally it is applied as a mild escharotic to fungous granulations.

ALUMINII SULPHAS—ALUMINIUM SULPHATE.

What is aluminium sulphate?

It is a powerful astringent and antiseptic, and is employed for these purposes externally and as an injection in gonorrhœa. Its solution has been used to preserve cadavers for dissection.

CUPRUM—COPPER.

What are the sources and the effects of copper?

Copper is obtained from copper pyrites, a double sulphide of iron and copper. *The metal* itself is inert. *The salts* are mild *astringents* and *stimulan*[illegible] in weak solution, and when strong, act as *irritants;* in powder they are mild *caustics.* Taken *internally in small doses* they are astringent, and are supposed to act as tonics to the nervous system. In *larger doses* they are local *emetics.* In *excessive amounts* they act as *irritant poisons*, causing gastro-intestinal inflammation, hæmaturia, sometimes jaundice, convulsions, paralysis, delirium, coma and death. The *post-mortem* reveals fatty degeneration of the liver and decomposition of the blood corpuscles. When taken continuously for a *very long time* a condition of chronic poisoning results, with giddiness, occasional diarrhœa, cramps, wasting, and sometimes progressive palsies, respiratory failure and death. A *green line* is sometimes observed on the gums.

The *tests* for the soluble copper salts are *potassium ferrocyanide*, which gives a mahogany-colored precipitate; *ammonia*, which gives a beautiful blue color, and *metallic iron* on which metallic copper will be deposited from a solution. The treatment of *acute poisoning* is albumen (milk or eggs); opium, demulcents and treating symptoms as they arise. In *chronic poisoning*, endeavor to eliminate it as if the poison were lead.

For what purposes is copper used in medicine?

It is used *internally* as an *astringent* in *chronic diarrhœa*, especially when ulceration exists, as an *emetic* (the sulphate), especially in narcotic poisoning, and occasionally as a *tonic* in nervous debility and functional nervous diseases. *Locally* it is efficacious as a *stimulant* to ulcers, as an *escharotic* in granular conjunctivitis and flabby granulations, and as an *astringent* injection in gonorrhœa.

What are the preparations of copper and their doses?

CUPRI SULPHAS (*copper sulphate*) called also *blue vitriol*, or *blue stone.* Dose as an *astringent* gr. ¼–j, in pill; as an *emetic* gr. iij–v; as an injection in gonorrhœa gr. ¼–j to f℥j.

CUPRI ACETAS (*copper acetate*), dose gr. ⅛–¼.

ZINCUM—ZINC.

What are the sources, action, uses and preparations of zinc?

Zinc is obtained principally from the native carbonate and sulphide. The *effects* of the *zinc salts* are similar to those of copper, but are less powerful. In *excessive doses* they cause an *acute poisoning* very similar to that produced by copper, the *antidotes* being milk and eggs, alkalies and their carbonates. *Chronic poisoning* is so rare as to be disputed. The *test* for zinc in solution is the addition of *ammonium sulphide*, which precipitates *white* zinc sulphide, the only white sulphide met with.

They are used as *astringents* in diarrhœas; as *emetics;* as *nerve tonics* in epilepsy and chorea, and locally as *astringents* in conjunctivitis, gonorrhœa, etc.; as *sedatives* and *astringents* in eczema and erysipelas; as *dusting powders*, and as mild *stimulants* to ulcers.

ZINCI SULPHAS (*zinc sulphate—white vitriol*), dose as a *tonic* or *astringent* gr. ij–v; as an *emetic* (safer than copper sulphate) gr. x–xx. Locally, as a collyrium or as an injection in gonorrhœa, gr. j–ij to f℥j.

ZINCI OXIDUM (zinc oxide) used internally in *catarrhal diarrhœa, membranous enteritis, epilepsy, chorea,* and occasionally to check *colliquative sweats.* Dose gr. j–v in pill. It is used also as a *dusting powder.*

The *ointment* (*unguentum zinci oxidi*) is much employed.

Impure or *commercial zinc oxide* (*zinci oxidum venale*), sometimes called "*tutty,*" is used chiefly in pharmacy.

ZINCI ACETAS (*zinc acetate*) is used as a *collyrium* (gr. ij to f℥j) as an injection in the third stage of *gonorrhœa* (gr. j–xx to f℥j) and in *leucorrhœa* (ʒj to Oj).

ZINCI CARBONAS PRÆCIPITATUS (*precipitated zinc carbonate*) is used as a *dusting powder* and a mild *astringent* ointment (ʒj–℥j).

ZINCI CHLORIDUM (*zinc chloride*) is a powerful *caustic* and *antiseptic*, employed to destroy lupus and indolent granulations. It is used also to preserve cadavers for dissection. *Burnett's disinfecting fluid* contains gr. 200 to f℥j.

Liquor zinci chloridi (*solution of zinc chloride*) may be used to disinfect water-closets and sinks.

ZINCI IODIDUM (*zinc iodide*) is a local stimulant and caustic.

ZINCI VALERIANAS (*zinc valerianate*) is employed as a *nerve tonic* in epilepsy and chorea; dose gr. j–ij, t. d.

ARGENTUM—SILVER.

What are the physiological effects of silver?

Metallic silver is inert. Of its soluble salts, the oxide and nitrate are chiefly employed. *Locally* applied *the nitrate* coagulates albumen, is an astringent and superficial caustic, contracting the cutaneous vessels and producing a white stain on the skin which becomes black on exposure to light. Taken *internally* they are astringent, and after absorption exert a tonic influence upon the nervous system. In *large doses* they are gastro-intestinal irritants, often producing also violent convulsions, disturbed respiration, coma, dilated pupils, paralysis and death from respiratory failure. If *too long continued*, even in minute doses, *chronic argyria* results, consisting in emaciation, impaired memory and a peculiar indelible *blue discoloration*, first manifesting itself on the mucous membranes, and extending to the skin and internal organs.

What are the tests for silver, and how should argyria be treated?

The addition of *hydrochloric acid* or *sodium chloride* to a solution of silver produces a white precipitate of silver chloride, soluble in ammonia. *Acute argyria* is treated by giving immediately, as an *antidote*, a large amount of common salt, and treating symptoms p. r. n. In *chronic argyria* nothing does much good as a rule; potassium iodide may be tried as an eliminative agent.

What are the medicinal uses of the silver salts?

They are used as *astringents* in *chronic diarrhœas* and in *dysenteries* (internally or by enema) especially when ulceration is present, and are very useful in organic dyspepsias especially in *gastric ulcer* and in *chronic gastritis*. As a *nerve tonic* they are employed in *locomotor ataxia* and other *spinal scleroses*. *Externally* as a *stimulant* and *mild caustic* the nitrate is applied to slowly *granulating surfaces* or to unhealthy *ulcers*. As an *antiphlogistic* and *astringent* it is used in solution in various inflammations of the mucous membranes, as *conjunctivitis*, *pharyngitis*, *laryngitis*, etc., and may be used as an injection in the latter stages of gonorrhœa (gr. j–ij to f℥j) in the male, or in *acute vaginitis* (painting the inflamed vagina with strong solutions). It is employed also in superficial inflammations of the skin, in erysipelas and to prevent pitting in smallpox.

What are the officinal silver salts and their doses?

Argenti Nitras (*silver nitrate*), dose gr. ⅛–¼ gradually increased to gr. ss–j. Great care should be taken to prevent staining the skin.

For external use solutions are employed varying in strength from gr. j–ʒij to f℥j of distilled water.

Moulded silver nitrate or *lunar caustic* (*argenti nitras fusus*) is silver nitrate melted and poured into small moulds, for external use.

Diluted silver nitrate (*argenti nitras dilutus*) is equal parts of silver nitrate and potassium nitrate, moulded as above.

ARGENTI OXIDUM (*silver oxide*), dose gr. ss–j in pill.

ARGENTI IODIDUM (*silver iodide*), dose as an alterative gr. j.

ARGENTI CYANIDUM (*silver cyanide*), used for preparing diluted hydrocyanic acid.

BISMUTHUM—BISMUTH.

What are the actions, uses and preparations of bismuth?

Metallic bismuth is inert. The *less soluble salts* are not actively toxic when pure, as they are absorbed with difficulty. *Bismuth and ammonium citrate* is much more irritant, and may in large doses cause gastro-enteritis. In medicinal doses, they are astringent and sedative to the mucous membranes. A portion is absorbed and is eliminated by the kidneys chiefly, while that which is not absorbed is converted into a sulphide and colors the stools black. *Locally* applied they are antiseptic and sedative.

They are *used* internally as *sedatives* and *astringents* to check nausea and vomiting in *gastric irritation*, and to relieve pain in *gastralgia*, *gastric ulcer* and *cancer*. In *acute diarrhœas* from irritation and in *chronic diarrhœas*, especially those occurring in children during the summer months, they are very valuable. *Externally* as mild astringents and antiseptics they are useful in the treatment of *ulcers*, and as an injection (suspended in mucilage) in acute *gonorrhœa* and in *vaginitis*. They are also used as dusting powders in *intertrigo* and as snuff in acute *coryza*.

BISMUTH SUBNITRAS (*bismuth subnitrate*) called also *pearl white* or *magistery of bismuth*, dose gr. v–ʒj.

BISMUTHI SUBCARBONAS (*bismuth subcarbonate*), dose gr. v–xxx.

BISMUTHI ET AMMONIA CITRAS (*bismuth and ammonium citrate*), dose gr. j–v.

CERII OXALAS—CERIUM OXALATE.

What is cerium oxalate?

It is supposed to resemble the salts of bismuth in its effects, but has not been investigated. It is *used* with success in *reflex vomiting*, particularly the *vomiting of pregnancy*. Dose gr. j–iij, t. d. in pill or capsule.

ORDER V.—ANTACIDS.

What are antacids?

Antacids are remedies capable of neutralizing acids. The term, however, is here used in a more limited sense, and embraces only those medicines which are used in medicine to correct excessive acidity in the alimentary canal, as manifested by heartburn, acid eructations, gastric uneasiness, and diarrhœa of infants with "chopped spinach stools." Excessive acidity may be due to an excessive secretion of acid by the stomach, and here the antacids may be given after meals to neutralize the acid present, or the same effect may be produced by administering an acid before meals, which will decrease the acid secretion. On the other hand, it may be due to a deficient secretion of acid and consequent imperfect digestion and fermentation of the food. In these cases an antacid given before meals is useful by increasing the outward osmosis of acid, or a mixture of pepsin and acid after meals may supply the place of the deficient secretion. In acidity due to the development of the *sarcina ventriculi*, sulphurous acid, the sulphites, carbolic acid or other antizymotics give the best results.

Name the antacids employed for the above purposes.

While all of the alkalies, alkaline earths and their carbonates are really antacids, yet in medical practice the sodium and calcium salts are chiefly used. *Solution of potassa* (*q. v.*) is sometimes, but not often, employed. The *spirit* and *aromatic spirit of ammonia* (*q. v.*) are frequently used, especially in sick headache or where a stimulating antacid is required.

SODIUM.

What are the effects and uses of the sodium salts?

Caustic soda and its solution are escharotics. The *sodium salts* taken on an empty stomach increase the secretion of acid gastric juice, but if given after a meal in sufficient quantity they neutralize the acid present. They diffuse readily into the blood and act somewhat as do the potassium salts, being, however, less irritant, more feebly diuretic, and possessing little if any poisonous influence over the (mammalian) heart, nerves or muscles.

The medicinal uses of the sodium preparations have been considered in discussing the general uses of the antacids.

What are the preparations of sodium?

LIQUOR SODÆ (*solution of soda*), dose ♏ij–x freely diluted.

SODII CARBONAS (*sodium carbonate*) is much used as an antacid in dyspepsia. In overdoses it is a corrosive poison. The antidotes are the vegetable acids. Dose gr. x–xxx. It is sometimes deprived of its water of crystallization and prescribed in pill form as the *dried carbonate* (*sodii carbonas exsiccatus*), in doses of gr. v–xv.

The *commercial bicarbonate* (*sodii bicarbonas venalis*) is only used internally in a more purified form, as SODII BICARBONAS (*sodium bicarbonate*), which is preferred to the carbonate because it is a more permanent salt and is less irritating to the stomach. Dose gr. x–xxx. It is an ingredient of *seidlitz powders* (*q. v.*) and other preparations. The *troches* (*trochisci sodii bicarbonatis*) each contain gr. iij of the bicarbonate.

The other sodium salts are rarely used as antacids and most of them have been sufficiently described previously.

CALCIUM.

What are the effects, uses and preparations of calcium?

Unslaked lime is a caustic. The *calcium salts* are antacid, slightly astringent and sedative to the mucous membranes, and are consequently much used in vomiting and in diarrhœa. The vapor arising from slaking lime is inhaled with advantage in membranous croup and in diphtheria. The preparations are LIQUOR CALCIS (*lime-solution—lime-water*), used as an antacid and gastric sedative in nausea and vomiting from irritability of the stomach, and often added to milk to increase its digestibility and render it more readily tolerated by the stomach. As an antacid and astringent it is useful in diarrhœa, especially in teething children. Locally it is used as an alkaline wash in various skin affections and as a dressing to burns, scalds, ulcers, etc., in the form of the *liniment* (*linimentum calcis*) often called *carron oil* (equal parts of lime-water and cotton-seed oil).

Syrupus Calcis (*syrup of lime*) is used as an astringent in diarrhœas and as an antidote to poisoning by carbolic acid. Of the syrup ♏xx = f℥j of lime-water. Dose fʒss–ij, freely diluted.

Calcii Carbonas Præcipitatus (*precipitated calcium carbonate*), (dose gr. xx–ʒj) possesses no especial advantage over *prepared chalk* (*cretæ præparata*), which is used in diarrhœas. Dose gr. x–xxx. They are used externally as dusting powders in intertrigo. *Compound chalk powder* (*pulvis cretæ compositus*) contains 30 per cent. of prepared chalk. *Chalk mixture* (*mistura cretæ*) contains 20 per cent. of the compound powder in water and cinnamon water, and is much used, combined with astringents and opium, in diarrhœas, especially those of teething children. Dose f℥ss–j. *Troches of chalk* (*trochisci cretæ*), each contains gr. iv. of prepared chalk.

Other preparations of calcium have been previously considered.

GROUP II.—TOPICAL MEDICINES.

Class I.—Antiseptics.

What are antiseptics?

Antiseptics are medicines which prevent fermentation and decomposition by destroying, or preventing the development of, the germs on which these processes depend. They are not always *germicides* (remedies which kill the germs of disease), for some of them hinder the growth and prevent the development of fresh germs, without destroying those already present; nor are they always *deodorants* (remedies which destroy disagreeable odors), for the microbes of disease may be destroyed, and foul chemical emanations continue, or the latter may exist without the presence of the former.

Name the chief antiseptics.

Antiseptics may be divided, according to their chemical composition, into the *inorganic* or *elementary* and *organic antiseptics* (or those belonging to the group of carbon compounds, including antiseptic oils and their camphors). To the first group belong potassium permanganate, chlorine water, chlorinated lime, Labarraque's solution, mercuric chloride, bromine, iodine, mercuric iodide, iodoform, iodol, sulphurous acid, sulphites, sulphides, boric acid, borates and many of the mineral salts previously mentioned, as iron sulphate, lead nitrate, etc. In the second division are included carbolic acid and the carbolates, creasote, benzoic acid and the benzoates, the antipyretics (*q. v.*), the antiseptic oils (*v.* "*Carminatives*") and thymol.

POTASSII PERMANGANAS—POTASSIUM PERMANGANATE.

What is potassium permanganate?

Potassium permanganate has been considered with the preparations of manganese (*v.* "*Mineral Tonics*"). Its disinfectant powers are great, but it is decomposed immediately on contact with organic matter, and hence is chiefly used in solution as a gargle in scarlatina and diphtheria, as a lotion to cancerous and other ulcers, to correct fœtor in otorrhœa, etc., and as an injection in leucorrhœa and in gonorrhœa. It is given internally as an emmenagogue (*q. v.*).

AQUA CHLORI—CHLORINE-WATER.

What is chlorine-water?

It is an aqueous solution, containing at least 0.4 per cent. of *chlorine*. It is a powerful irritant and antiseptic. Albumen is the best *antidote*.

It is chiefly used, diluted, as a gargle in *diphtheria*, and as a wash for foul *ulcers* and *wounds*.

CALX CHLORATA—CHLORINATED LIME.

What is chlorinated lime?

It is composed of calcium hypochlorite and chloride, and when exposed to the air is decomposed, yielding about 25 per cent. of chlorine. It is an antiseptic, and is used to disinfect the air of sick rooms, urine, sputum and fecal discharges and privies.

LIQUOR SODÆ CHLORATÆ—SOLUTION OF CHLORINATED SODA.

What is this substance?

Solution of chlorinated soda, or *Labarraque's solution*, contains sodium hypochlorite, and may be used for the same purposes as the foregoing preparations.

HYDRARGYRI CHLORIDUM CORROSIVUM—MERCURIC CHLORIDE.

What is mercuric chloride?

This preparation has been considered with the mercurial salts (*v.* "*Alteratives*"). It is a valuable germicide, and is used in aqueous solutions of various strengths (1–2000 to 1–16,000) in all manner of surgical operations and affections where an antiseptic is required and can be employed. As several cases of poisoning have been reported, especially from its use in gynæcological and obstetrical practice, it should be employed with some caution.

BROMUM—BROMINE. IODUM—IODINE.

Are these substances antiseptic?

Bromine (*v.* "*Escharotics*") and *iodine* are powerful antiseptics, but are rarely used for this purpose, as their management requires great care and experience.

HYDRARGYRI IODIDUM RUBRUM—MERCURIC IODIDE.

Is mercuric iodide antiseptic?

Mercuric iodide is a powerful germicide, and has been employed as a substitute for corrosive sublimate, but, so far, has not superseded the latter.

IODOFORMUM—IODOFORM.

What is iodoform?

Iodoform is formyl teriodide, and occurs in minute yellowish crystals, with a disagreeable odor. It is insoluble in water, but freely soluble in ether and alcohol.

What are its effects and uses?

Locally, it is an antiseptic and local anæsthetic. It prevents the multiplication of germs, but will not destroy them if present before its use. It seems to be more readily absorbed by abraded than by mucous surfaces. *Internally*, it is tonic and alterative. *Moderate doses* stimulate the cardio-inhibitory centre, slowing and strengthening the cardiac beat and elevating the blood pressure, while *large doses* depress this centre, and finally paralyze the cardiac muscle. The *temperature* is generally reduced. It increases the salivary, biliary and intestinal secretions, and is eliminated chiefly by the kidneys (as sodium iodate), but to a slight extent by the lungs also. When excessive amounts are absorbed, either from internal or external sources, glomerulo-nephritis and fatty degenerations of various organs occur. Cases of poisoning may be divided into six classes, the danger increasing progressively from the first to the last: 1. High fever; 2. Fever, gastro-entero irritation, rapid pulse; 3. Very rapid, compressible pulse, no fever; 4. Very rapid pulse and high fever; 5. Great depression and collapse, rapidly fatal; 6. Symptoms like meningitis. Should poisoning occur, remove every particle of the dressing if it has been used locally, give opium and stimulants and treat symptoms. Iodoform has been *used* internally as a *cardiac tonic* in valvular disease with insufficient hypertrophy, and as an *alterative* in syphilitic rheumatism, neuralgiæ and the early stages of phthisis. In *diabetes mellitus* it has been advantageously given. *Externally*, it is employed as an anæsthetic and antiseptic dressing to irritable ulcers of all kinds, burns and wounds. In *ethereal solution* it has been injected into the cavities of strumous abscesses, after the evacuation of their contents, to destroy the giant cells of tubercle and promote healthy granulation. In *suppositories* it is used in inflammation and ulceration of the vagina, uterus and rectum. *Bougies* containing iodoform are sometimes used in septic affections of the uterus and in gonorrhœa.

Dose gr. ¼–v, in pill or capsule.

The *ointment* (*unguentum iodoformi*) contains 10 per cent. of iodoform.

IODOL.

What is iodol?

Iodol (not officinal) is made by the action of iodine on pyrol, and contains 88.9 per cent. of the former. It is recommended as a substitute for iodoform, being tasteless, odorless, and, as it is more slowly absorbed, less likely to produce dangerous effects. It is especially recommended in nasal, pharyngeal and laryngeal cases, particularly in tubercular laryngitis, and may be used either in powder (by insufflation) or in solution with alcohol and glycerin. It has also been used internally in those cases to which iodoform is applicable. Dose gr. ss–iij, in pill or capsule.

ACIDUM SULPHUROSUM—SULPHUROUS ACID.

What is sulphurous acid?

Sulphurous acid is an aqueous solution of about 3.5 per cent. of sulphurous acid gas.

What are its effects and uses?

It is a powerful deoxydizing agent, and deodorant. When sufficiently concentrated the gas is probably a germicide. When inhaled it is irritant, and, if in sufficient amount, causes inflammation and even acts as a caustic from the formation of sulphuric acid. It is eliminated by the urine and feces as sulphates. It is *used internally* (diluted) in *yeast-vomiting* to prevent the formation of *sarcina ventriculi* in *flatulency* depending on fermentation of the food, and *locally* as a wash in various parasitic skin diseases. In the form of burning sulphur it is employed to disinfect rooms. Dose ♏v–fʒj, freely diluted.

THE SULPHITES AND SULPHIDES.*

What are the effects and uses of these salts?

The *effects* of the *sulphites* depend upon the sulphurous acid which they contain, and which is readily evolved on the addition of almost any acid. On exposure to the air they are converted into sulphates. Taken internally they are decomposed by the acid of the gastric juice, evolve sulphurous acid, are finally converted into sulphates, and thus absorbed and eliminated. They are *used* to fulfill the indications for sulphurous acid. The dose of *sodium sulphite* (*sodii sulphis*) is gr. v–xxx, t. d.; *sodium bisulphite* (*sodii bisulphis*) gr. v–xx; *sodium hyposulphite* (*sodii hyposulphis*) gr. v–xx; *potassium sulphite* (*potassii sulphis*) gr. v–x; *magnesium sulphite* (*magnesii sulphis*) gr. v–xx.

The *sulphides* are said to possess the power of arresting the formation of pus in threatened boils and abscesses, and are used internally for this purpose.

Calx sulphurata (*sulphurated lime*) consists of calcium sulphate and calcium sulphide (not less than 36 per cent.), and is given in doses of gr. $\frac{1}{10}-\frac{1}{2}$, repeated every $\frac{1}{2}$–1 hour. *Sulphurated potassa* will be found among the sulphur preparations (*v.* "*Cathartics*").

ACIDUM BORICUM—BORIC ACID.
SODII BORAS—BORAX.

What are the effects and uses of boric acid and its salts?

Locally boric acid is antiseptic and deodorant. *Internally* they are somewhat diuretic, and retard the decomposition of the urine. Two fatal cases from the injection of large quantities into the pleural sac, and the cavity of a large lumbar abscess, have been reported, death being due to collapse and cardiac failure.

Boric acid is used as an antiseptic in powder or solution in many external inflammations and wounds, and in inflammations and aphthous or diphtheritic ulcerations of the mouth and fauces, the acid or its salts are of undoubted value.

In solution it has also been used to wash out *abscess cavities* and as an injection in *gonorrhœa.* As a *disinfectant* and *deodorant* in ophthalmic and aural practice it is very useful. Boric acid is recommended internally in *cystitis* depending on ammoniacal decomposition of the urine, and as an injection into the bladder in the cystitis of spinal diseases. Dose of the *acid* gr. v–x, t. d.; of the salt gr. xx–ʒj.

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* See footnote, p. 71.

ACIDUM CARBOLICUM—CARBOLIC ACID.

What is carbolic acid?

Carbolic acid, *phenol* or *phenic acid* is an oily liquid, or crystalline solid, which readily deliquesces, and is derived from coal-tar oil by distillation.

What are the tests for carbolic acid?

The addition of *ferric sulphate* produces a lilac color; *bromine-water* causes a yellowish precipitate; it coagulates albumen, and precipitates nitro-cellulose from collodion.

What are its physiological actions?

Carbolic acid is a local anæsthetic and caustic (producing a white eschar) when used in concentrated solutions; it is antiseptic and germicide. *Internally*, it is a powerful gastro-intestinal irritant when taken undiluted. In diluted solutions it is an astringent.

It first stimulates and then exhausts the vagi (causing slowing, followed by acceleration of the heart's action, which is finally paralyzed), reduces the arterial pressure by paralyzing the vasomotor centres of the cord, increases and then depresses the respiratory movements, from its influence on the vagi and respiratory centre, and in large doses lowers the temperature slightly. In poisonous doses it causes vertigo, tremors, contracted pupils, stupor, coma, impaired motion, sensation and reflex action, and in the lower animals convulsions of spinal origin. It is eliminated chiefly by the kidneys and lungs, imparting a smoky color to the urine when the dose is excessive.

This is a sign of impending danger.

If *poisoning* occur from external applications, remove the dressings immediately; if the acid has been swallowed, give a saturated solution of calcium carbonate. In either case administer atropine hypodermically, to counteract its respiratory and cardiac effects, and diluents freely, to aid its elimination.

What are its medicinal uses?

Carbolic acid was used externally as an antiseptic dressing and lotion in the various surgical affections and operations to which the mercuric chloride is applicable. It has also been used as a local anæsthetic previous to minor surgical operations, as the opening of small abscesses and felons, and in dilute solution to allay pruritus. It has been injected into the cavities of chronic abscesses and of the tunica vaginalis, to cause obliteration of their sacs after the withdrawal of the contained fluid.

Internally carbolic acid has been much used as a *gastric sedative* to check *vomiting*; as an *astringent* in *diarrhœa*; as an *antifermentative*; as a *germicide* in *sarcina ventriculi*; and as an *antizymotic* in *typhoid fever*, *smallpox*, *scarlatina*, and *diphtheria*. It is also used by inhalation in *nasal catarrh*, *hay fever*, *bronchorrhœa*, *pertussis*, and *pulmonary gangrene*.

What are its preparations and doses?

ACIDUM CARBOLICUM (*carbolic acid*), dose gr. j–ij.

ACIDUM CARBOLICUM CRUDUM (*crude carbolic acid*) may be used externally as a disinfectant. The *ointment* (*unguentum acidi carbolici*) contains 10 per cent. of the acid.

THE SULPHOCARBOLATES.

What are the sulphocarbolates?

Sodii sulphocarbolas (*sodium sulphocarbolate*),—the only one which is officinal,—is used *internally* to fulfill the indications of carbolic acid, and as an antifermentative in flatulency from fermentation of the food. It is also used *locally* as a sedative application to inflamed mucous membranes. Dose gr. x–xv, t. d.

CREASOTUM—CREASOTE.

What is creasote?

Creasote is a substance closely resembling carbolic acid, derived from wood-tar by dry distillation. It may be distinguished from carbolic acid by not coagulating collodion. It resembles carbolic acid in its effects and uses, and a solution of the latter is generally sold for it in the shops. The dose of pure creasote is ♏j–iij.

Aqua creasoti (*creasote water*) is a 1 per cent. solution of creasote.

ACIDUM BENZOICUM—BENZOIC ACID.

What is benzoic acid?

Benzoic acid is obtained from benzoin by sublimation, and is an ingredient of many of the substances (*the balsams*) previously considered. *Locally* it is an irritant, antiseptic and germicide. *Internally* it increases the secretions generally, and is eliminated chiefly by the urine increasing the acidity of that fluid, hence its value in the phosphatic diathesis. It has been used *locally* as an antiseptic in the treatment of wounds and ulcers, but is not much employed for these purposes at present. It is also used as a stimulant and antiseptic application in the treatment of *chapped hands*, *fissured nipples*, etc., but for this purpose the preparations of benzoin are preferred. Benzoic acid or its salts are of great value in the treatment of *cystitis* from alkaline urine, *phosphatic deposits* in the urine, etc., for by acidulating the urine it renders the phosphates more soluble. They are also used internally as *antiseptics* in *diphtheria*, *erysipelas*, etc. Benzoic acid is added to unguents, to prevent rancidity. The dose is gr. v–xx; but for internal administration the salts are generally preferred.

Sodii Benzoas (*sodium benzoate*) has been used as an *antipyretic* in *rheumatism*, and as an *antiseptic* in *pertussis*, *diphtheria* and *the exanthemata*. Dose ʒj–ij.

Ammonii Benzoas (*ammonium benzoate*) is the best remedy for *incontinence* due to vesical irritation from alkaline decomposition of the urine. Dose gr. v–xx.

THE ANTIPYRETICS AND ANTISEPTIC OILS.

Are these substances used as antiseptics?

The *antipyretics* (*q. v.*) have been sufficiently considered.

The antiseptic properties of the *volatile oils* classed with the "*Carminatives*" (*q. v.*), have been alluded to under that head. The only important one not hitherto mentioned is

THYMOL.

What is thymol?

Thymol (*cymylic phenol*) is a crystalline substance found in the oil of thyme (*oleum thymi*) (*q. v.*). *Locally* it is a powerful antiseptic and local anæsthetic. Given internally it lowers febrile temperature to some extent, and causes diaphoresis. In excessive amount it causes tinnitus aurium, deafness, diarrhœa, and sometimes delirium and collapse. It is used as an *antiseptic gargle* and *mouth-wash* in aphthous and diphtheritic ulcers of the mouth and fauces, and internally as a *gastric sedative* to allay vomiting. As an *anti-fermentative*, in flatulency from fermentation of the food and in intestinal indigestion, it is very useful. Dose gr. ss–ij. As much as gr. xx–xxx have been given in 24 hours. It is administered in solution, in glycerin, alcohol and water.

Class II.—Irritants.

What are irritants?

Irritants are medicines which are used locally to produce counter-irritation or inflammation of the parts to which they are applied. They are divided, according to the violence of their action, into Rubefacients, Vesicants, Suppurants, and Escharotics or Caustics.

ORDER I.—RUBEFACIENTS.

What are rubefacients?

Rubefacients are medicines which are employed to produce a powerful but temporary irritation and congestion of the surface. They are useful in arousing the system in shock; in stimulating the circulation of a part in case of frost-bite, or to aid in bringing on reaction in the cold stage of a congestive chill; in all cases of congestion and in the formative stages of inflammations. The application of rubefacients for the relief of neuralgic and muscular pains is often followed by improvement which may even be permanent.

Mention the principal rubefacients.

Mustard; capsicum; oil of turpentine; ammonia; Burgundy pitch, and Canada pitch.

SINAPIS ALBA—WHITE MUSTARD.
SINAPIS NIGRA—BLACK MUSTARD.

What is mustard?

Mustard is the seed of Sinapis alba, or white mustard, and Sinapis nigra, or black mustard (*Nat. Ord.* Cruciferæ).

What chemical principles do they contain?

Mustard seed contain a *fixed oil.* Black mustard seed yield on distillation a volatile oil which does not preëxist in the seed, but is formed by the action of water on *sinigrin* or *potassium myronate.* The white seed yield an *acrid fixed principle* which is formed by the action of water on *sinalbin.* These changes are probably due to the presence of *myrosin*, an albuminous ferment.

What are the effects and uses of mustard?

Locally, it is an irritant rapidly causing redness and a sensation of heat; if the application is long continued, inflammation and even gangrene may result. Internally it is a stomachic in small doses, an emetic in larger amounts, and a severe gastro-intestinal irritant if an excessive quantity be taken.

Mustard is *used* as a *rubefacient* in the form of a mustard plaster (made of the powdered seed known as mustard flour), whenever a mild counter-irritant effect is desired. The mustard should not be allowed to come in contact with the skin, but should be separated from it by a piece of gauze or a fold of muslin or newspaper. When a prolonged but gentle effect is desirable, the mustard may be added to a flaxseed poultice or diluted with flour. *Internally*, mustard-flour is used as an *emetic*, and is especially valuable when torpor of the stomach is present.

What are the preparations of mustard, and their doses?

The dose of powdered mustard as an emetic is ʒj–iv.

The officinal preparations are *mustard-papers* (*charta sinapis*), a convenient form for external use. Each square inch of paper contains about gr. vj of black mustard-flour. They should be dipped in warm water before applying. The *volatile oil* (*oleum sinapis volatile*) is very irritant, and is used in preparing the *compound liniment* (*linimentum sinapis compositum*).

CAPSICUM. OIL OF TURPENTINE. AMMONIA.

Are these substances used as rubefacients?

The uses of these substances as rubefacients will be found in detail under the respective drugs.

Linimentum ammoniæ (*liniment of ammonia*) contains 3 per cent. of water of ammonia in cotton-seed oil.

PIX BURGUNDICA—BURGUNDY PITCH.
PIX CANADENSIS—CANADA PITCH.

What are these drugs?

Burgundy Pitch is the prepared *resinous exudation* from Abies excelsa, or Norway spruce (*Nat. Ord.* Coniferæ). It contains a *resin* and a *volatile oil*, and is a [illegible]. used in the form of plaster in *subacute* and *chronic bronchitis*, to the back in *lumbago*, and to the joints in *chronic rheumatism.*

Pitch plaster with cantharides (*emplastrum picis cum cantharidê*) is more stimulating than the *plaster* (*emplastrum picis Burgundicæ*). *Iron*, *galbanum* and *opium plasters* contain Burgundy pitch.

CANADA PITCH is the prepared *resinous exudation* of Abies canadensis, or hemlock spruce (*Nat. Ord.* Coniferæ), and contains *resins* and a small quantity of *volatile oil.* Its effects and uses are identical with those of Burgundy pitch. *Canada pitch plaster* (*emplastrum picis canadensis*) is officinal.

ORDER II.—VESICANTS.

What are vesicants?

Vesicants are remedies which, when applied to the skin, cause sufficient inflammation to produce an effusion of serum under the cuticle, or, in other words, to raise a blister. They are also called *epispastics*, or *blisters.* They are used in inflammations of the serous membranes, especially when accompanied by an outpouring of serum; to deplete the vessels in inflammations of the brain and its membranes; in chronic joint affections; in neuritis, and for the relief of various neuralgic pains, and are sometimes used in inflammations of the parenchymatous viscera. They are contraindicated in the very young or very old, where there is great depression of the vital powers, or where there is very high arterial tension.

Name the principal vesicants.

Spanish fly, potato fly, and stronger water of ammonia.

CANTHARIS—CANTHARIDES.

What is cantharides?

Cantharis vesicatoria or Spanish fly (*Class*, Insecta; *Order*, Coleoptera) is an insect found in the temperate parts of Europe, but especially in Spain and Italy. When dried they contain a *volatile oil* and a neutral crystalline principle, *cantharidin*, the vesicating principle.

What are its effects and uses?

Locally, cantharides is an intense irritant to any surface with which it comes in contact; thus, applied to the skin it causes inflammation of sufficient intensity to result in a serous effusion under the cuticle, and if the application be too long continued, gangrene may result. Constitutional effect may be caused from the local application of cantharides. *Internally*, *in small doses*, it is diuretic; in *larger amounts* it is an irritant, causing pain on urination, priapism, strangury, and even bloody urine. Sexual desire does not usually occur. In *excessive doses* it is a gastro-enteric irritant, causing vomiting and purging, and even death, often preceded by dilated pupils, delirium, convulsions, and collapse. On *post-mortem examination* severe inflammation of the alimentary canal, kidneys, and bladder is found. The *treatment* consists in removing the application, or evacuating the contents of the stomach; the free use of diluents; opium (especially by the rectum); and avoiding all oily substances, as these aid the absorption of the poison.

What are its medicinal uses?

The internal uses of cantharides have previously been noticed (*v.* "*Emmenagogues*" and "*Diuretics*"). Externally it is used as a blistering agent, almost to the exclusion of other remedies. It must be remembered that poisoning may result from its local application.

What are its preparations and their doses?

The *cerate* (*ceratum cantharidis*) is used locally as a blistering agent, and is often known as *blistering cerate.* The *cerate of the extract* (*ceratum extractum cantharidis*) is made from an alcoholic extract, and is supposed to be more active than the former. *Cantharides paper* (*charta cantharidis*) is a convenient form of applying a blister. *Cantharidal collodion* (*collodium cum cantharide*) is applied with a brush, and is a convenient way of applying a blister to an irregular surface. The *liniment* (*linimentum cantharidis*) contains 15 per cent. of cantharides in oil of turpentine. The *tincture* (*tinctura cantharidis*) is used internally; dose gtt. v–x.

CANTHARIS VITTATA—POTATO FLY.

What is this substance?

The potato fly (not officinal) is an indigenous insect which contains *cantharidin*, and may be used as a substitute for the Spanish fly.

AQUA AMMONIÆ FORTIOR—STRONGER WATER OF AMMONIA.

Is this ever used as a blistering agent?

Stronger ammonia-water is a rapid but painful vesicant.

It forms the basis of *Granville's vesicating lotion* and of *Gondret's vesicating ointment.* It is but little used for this purpose.

ORDER III.—SUPPURANTS.

What are suppurants?

Suppurants are remedies which cause such powerful irritation of the surface to which they are applied as to produce a crop of pustules. They are seldom employed at present except as an application to the throat and chest in *chronic laryngeal* or *bronchial affections*, or to the surface of a joint when *chronic inflammation* is present. The only medicines belonging to this order are *Croton oil* and *antimonial ointment.* These remedies have been previously described. Antimonial ointment is the more painful and its effects are more lasting.

ORDER IV.—ESCHAROTICS.

What are escharotics?

Escharotics are medicines which are applied locally to destroy the structure and vitality of the tissues. The dead tissue excites inflammation, and is thrown off by ulcerative action. It is called the *slough*, or *eschar.* Escharotics are *used* to destroy *morbid growths*, as lupus, epithelium, condylomata, warts, fungous granulations, etc.; to *destroy the virus* of malignant pustule, hospital gangrene, the bites of rabid animals or poisonous reptiles, the virus of chancre, etc.; to substitute a healthy for diseased action, and to stimulate indolent ulcers, sinuses, etc.

Mention the principal medicines used for these purposes?

Caustic potash; caustic soda; arsenious acid; bromine; zinc chloride; acid nitrate of mercury; corrosive sublimate; potassium bichromate; the mineral acids; silver nitrate; copper sulphate; and burnt alum.

POTASSA.

What is potassa?

Potassa is formed by the rapid evaporation of the solution of potassa, and is moulded into thin cylindrical sticks.

What are its effects and uses?

It is an exceedingly powerful caustic, destroying the surrounding tissues and penetrating to some depth below the surface. When it is used, it is well to protect the surrounding tissues from its action by adhesive plaster with a hole cut in its centre, through which the caustic is applied. It is used when a powerful effect is desired.

Potassa cum Calce (*potassa with lime*) consists of equal parts of potassa and quicklime, and is a powerful caustic. It is sometimes called *Vienna paste.*

SODA.

What is soda?

Caustic soda is made by the rapid evaporation of the solution of soda, and is a very powerful caustic, resembling potassa in its effects and uses. *London paste* is made by rubbing up equal parts of soda and lime.

ACIDUM ARSENIOSUM—ARSENIOUS ACID.

Is arsenious acid used as a caustic?

The uses of this substance as a caustic will be found under the article "Arsenic" (*v.* "*Alteratives*").

BROMUM—BROMINE.

What is bromine?

Bromine is a halogen element, and is a very powerful caustic. It is a volatile liquid, and has very great affinity for hydrogen. *Locally* it is a powerful deodorant and disinfectant, and a severe and deeply penetrating caustic. When *inhaled*, it is an intense irritant, producing laryngitis, bronchitis and even pneumonia. *Internally*, if not sufficiently diluted, it is a corrosive poison. It is *used* as a *caustic* in *hospital gangrene* after the removal of the slough. As it is heavier than water it may be poured into a wide-mouthed bottle half filled with water, which will prevent it from giving off irritating fumes. From this it may be sucked up with a syringe and injected into the wound which it is desired to cauterize. The fumes are sometimes cautiously inhaled for the cure of *acute coryza*, *chronic nasal catarrh*, *ozæna*, *hay asthma*, etc. For purposes of inhalation a solution of ʒss in ℥iv of alcohol may be used.

ZINCI CHLORIDUM—ZINC CHLORIDE.

LIQUOR HYDRARGYRI NITRATIS—SOLUTION OF MERCURIC NITRATE.

HYDRARGYRI CHLORIDUM CORROSIVUM—MERCURIC CHLORIDE.

Are these medicines escharotics?

The uses of these substances as caustics will be found under Zinc (*v.* "*Astringents*") and Mercury (*v.* "*Alteratives*").

POTASSII BICHROMAS—POTASSIUM BICHROMATE.

What is potassium bichromate?

It is an irritant *internally*, and in overdoses a corrosive poison. *Externally* it is a *caustic*, used to destroy syphilitic condylomata, warts, etc. *Internally* it is used as an *alterative* in doses of gr. ⅙ t. d.

THE MINERAL ACIDS.

Are the mineral acids used as caustics?

The mineral acids are powerful caustics, and are often employed to remove warts, or other excrescences, to cauterize chancres, indolent sinuses and ulcers. Nitric acid is preferred as an escharotic.

SILVER NITRATE, COPPER SULPHATE, and ALUM have all been previously spoken of as caustics under their appropriate heads.

Class III.—Demulcents.

What are demulcents?

Demulcents are bland remedies which, when applied to inflamed or irritated surfaces, exert a soothing influence upon them and are employed internally for this purpose. They are *used* in acute inflammations of the alimentary canal; in pharyngeal, laryngeal and bronchial irritation; in renal, cystic, and urinary affections generally; and to suspend medicinal substances which are insoluble in water. They are also used as light articles of diet.

Describe the demulcents.

AQUA (*water*) is used in medicine in its purest attainable state, *i. e.*, rain or melted snow. For pharmaceutical purposes it should only be used in the form of *distilled water* (*aqua destillata*). A certain amount of water is necessary for the proper performance of the functions of the body. It is an *active diuretic*, increasing not only the watery, but also the solid ingredients of the urine. It is *eliminated* by the kidneys, skin, lungs and bowels. It is *used* as a *diuretic* in acute renal diseases, and is also often serviceable in chronic Bright's disease. To dilute a highly concentrated urine in *ardor urinæ*, especially when there is a tendency to the formation of gravel or calculi, it is invaluable.

It is useful in fevers, as it aids the elimination of the waste products. *Externally*, it is used in the form of baths, either hot or cold, not only for purposes of cleanliness, but also as a therapeutic agent. Impregnated with carbonic acid gas under pressure, it makes an agreeable drink known as *soda-water*, which is often useful in allaying nausea and vomiting.

ACACIA, or *gum arabic*, is a *gummy exudation* from Acacia Verek and other species (*Nat. Ord.* Leguminosæ), trees of Africa. It contains *arabin*, and is much *used* in solution as a demulcent in various forms of *sore throat*. It is also used in making emulsions and pills.

Its preparations are: a *mucilage* (*mucilago acaciæ*), and *syrup* (*syrupus acaciæ*). *Almond mixture* (*mistura amygdalæ*) is an agreeable form for administration.

TRAGACANTHA (*tragacanth*) is a *gummy exudation* from Astragalus gummifer (*Nat. Ord.* Leguminosæ), and contains *arabin* and *tragacanthin.* It is only *used* internally as an agent to suspend heavy powders or to give consistence to lozenges. A *mucilage* (*mucilago tragacanthæ*) is officinal.

ULMUS (*slippery-elm bark*) is the *inner bark* of the Ulmus fulva, or slippery elm (*Nat. Ord.* Urticaceæ), and contains a large amount of mucilaginous matter, and though more often used *externally* as an emollient poultice, is sometimes employed as a *demulcent* in inflammations of the bowels, and in laryngitis. A *mucilage* (*mucilago ulmi*) is officinal.

ALTHÆA, the root of A. officinalis, or marsh-mallow (*Nat. Ord.* Malvaceæ), is a pleasant demulcent. A *syrup* (*syrupus althææ*) is officinal.

LINUM (*flaxseed*) is the *seed* of Linum usitatissimum, or flax (*Nat. Ord.* Linaceæ), and contains *fixed oil*, *mucilaginous matters*, *vegetable albumen*, etc. The *oil* (*oleum lini*) is a laxative, but is chiefly used externally in emollient liniments. The seed may be used internally as an infusion, flavored with lemon and sugar (*flaxseed tea*), in bronchial catarrhs, enteric inflammations, dysentery and renal, cystic or urethral irritations. The ground seed are much used to make emollient poultices.

SASSAFRAS MEDULLA (*sassafras pith*) is the pith of the stems of S. officinale (*Nat. Ord.* Lauraceæ). The *mucilage* (*mucilago sassafras medullæ*) may be *used* internally as a demulcent, but is chiefly employed locally in inflammations of the eye.

CYDONIUM, the seed of Cydonium vulgaris, or quince (*Nat. Ord.* Rosaceæ), are sometimes used externally and internally as a demulcent or emollient *mucilage* (*mucilago cydonii*).

GLYCYRRHIZA, commonly called *liquorice-root*, is the root of G. glabra (*Nat. Ord.* Leguminosæ). It contains a *glucoside* (*glycyrrhizin*), *asparagin*, *resin*, etc. It is chiefly used as a demulcent in catarrhal affections of the respiratory organs and to disguise the taste of quinine, of the ammonium salts, and of other disagreeable medicines; occasionally, also, in kidney and bowel complaints. The preparations are an *extract* (*extractum glycyrrhizæ*), often called *liquorice; refined extract* (*extractum glycyrrhizæ purum*); *fluid extract* (*extractum glycyrrhizæ fluidum*), used as an addendum to cough medicines; *ammoniated glycyrrhizin* (*glycyrrhizinum ammoniatum*) dose gr. v–x; *compound glycyrrhiza mixture, brown mixture* (*mistura glycyrrhizæ composita*) contains the refined extract, acacia, sugar, paregoric (12 per cent.), antimonial wine (6 per cent.), sweet spirits of nitre and water; dose f℥ss. *Compound liquorice powders* (containing sulphur and senna,—used as a laxative), have been previously mentioned.

CETRARIA.—Cetraria islandica, or Iceland moss (*Nat. Ord.* Lichenes), is a lichen growing in the northern portions of both continents. It contains *lichenin* and a bitter principle, *cetrarin*, and is used as a demulcent. A *decoction* (*decoctum cetrariæ*) is officinal.

CHONDRUS.—Irish Moss, or Carrageen (*Nat. Ord.* Algæ), is a marine plant found on the coast of Ireland and New England. It contains *carrageenin*, etc., and is used as a nutritive (in the form of a blanc-mange); as a demulcent and locally as an emollient poultice.

AMYLUM (*starch*).—This is the *fecula* of the *seed* of Triticum vulgare (*Nat. Ord.* Graminaceæ). With iodine its solution forms a rich blue iodide. It is converted into glucose in the alimentary canal, and thus absorbed. It is used as an article of diet and locally as a dusting powder. Its solution is employed as a vehicle for laudanum enemata.

Glyceritum Amyli (*glycerite of starch* or *plasmine*) is used as a vehicle for astringent applications to the eye, and as an unguent in scarlatina and smallpox. *Amylum iodatum* (*iodized starch*) has been previously spoken of.

LYCOPODIUM, the *sporules* of L. clavatum, or club-moss (*Nat. Ord.* Lycopodiaceæ), is used as a dusting powder for intertrigo, and is very useful in children with excoriated nates.

ICHTHYOCOLLA (*isinglass*) is prepared from the swimming bladder of Acipenser huso (the sturgeon) and other species. *Class*, Pisces; *Ord.* Sturiones). It is the purest form of gelatine, and is chiefly used locally as a *plaster* (*emplastrum ichthyocollæ—court-plaster*). Gelatine is also used as an article of diet, and in the form of capsules for administering other medicines.

Class IV.—Emollients.

What are emollients?

Emollients are bland, fatty substances, used externally to soften the skin and render it more pliable or to serve as a vehicle for other medicaments.

Describe the emollients.

ADEPS (*lard*), the prepared fat of Sus Scrofa (the hog), consists of olein and stearine, and is used in the preparation of unguents. *Ointment* (*unguentum*) consists of lard (80 per cent.), melted with yellow wax. *Cerate* (*ceratum*) contains 70 per cent. of lard and 30 per cent. of white wax. *Adeps benzoinatus* (*benzoinated lard*) contains 2 per cent. of benzoin to prevent rancidity.

SEVUM (*suet*), the internal fat of the abdomen of Ovis Aries (the sheep), consists, when purified, almost entirely of stearine.

LANOLIN (not officinal) is a fatty salt of cholesterin, and is the purified fat of sheeps' wool. It mixes readily with water.

CETACEUM (*spermaceti*), a concrete fatty substance obtained from Physeter macrocephalus or sperm-whale. A *cerate* (*ceratum cetacei*) is officinal.

CERA FLAVA (*yellow wax*) and CERA ALBA (*white wax*). The latter is the former which has been bleached. They are used in making cerates, plasters and ointments.

ACIDUM OLEICUM (*oleic acid*), used chiefly in preparing the oleates of mercury and veratrine.

GLYCERINUM (*glycerin*) is the hydrate of glyceril and exists in animal oils combined with fatty acids. Internally it is nutrient, demulcent, and, in large doses, laxative. As an enema it is laxative even in small amounts. Locally, it is much used as an emollient. *Glyceritum Vitelli* (*glycerite of yolk of egg*) is used in making emulsions. *Glycerite of Starch* (*v.* "*Amylum*") is used externally.

OLEUM THEOBROMÆ (*oil of theobroma*) or cacao-butter, is the *fixed oil expressed* from the *seed* of Theobroma Cacao (*Nat. Ord.*

Sterculiaceæ), and is used as an unguent and to give form and consistence to suppositories.

Oleum Gossypii Seminis (*cotton-seed oil*), a *fixed oil expressed* from the *seed* of Gossypium herbaceum (*q. v.*), is used as a substitute for almond or olive oil, and enters into the composition of numerous liniments.

Oleum Sesami (*oil of benne*) is a *fixed oil expressed* from the *seed* of Sesamum indicum (*Nat. Ord.* Pedaliaceæ). It is used for the same purposes as cotton-seed oil.

Petrolatum is a mixture of hydrocarbons, prepared from petroleum. Under the names of vaseline and cosmoline, the heavier petroleum oils are much used externally as emollients and as a basis for ointments, and internally to allay irritation of the mucous membranes.

Many of the "*Demulcents*" also are employed in the form of poultices as emollients.

Class V.—Protectives.

What are protectives?

Protectives are substances used to exclude light or air from the surface to which they are applied, or otherwise to protect it from injurious influences. Many *surgical appliances* are thus "protectives," but do not belong to the domain of "Materia Medica." The *plasters* and *unguents*, when simply used to protect the surface, come under this class. The following agents have not been previously considered: Collodion, solution of gutta-percha and solution of sodium silicate.

What are these substances?

COLLODIUM (*collodion*) is a solution of *pyroxylin* or soluble guncotton (*pyroxylinum*) (4 per cent), in stronger ether and alcohol. When applied to the skin, the solvents rapidly evaporate, leaving a colorless, transparent, flexible and strongly contractile film, closely adherent, difficult to detach, and impervious alike to air and water. It has been used in surgery as an antiphlogistic in inflammation, on account of its contractile power, and also applied on gauze, as a substitute for adhesive plaster in the treatment of wounds. Its contractile power is an objection to its use as a simple protective, for which purpose it is better to employ *flexible collodion* (*collodium flexile*), which contains Canada turpentine (5 per cent.) and castor oil (3 per cent.), and is more pliable and elastic. *Styptic collodion* (*collodium stypticum*) contains, in addition to collodion, tannic acid (20 per cent.), stronger ether (20 per cent.) and alcohol (5 per cent.).

LIQUOR GUTTA-PERCHÆ (*solution of gutta-percha*) contains gutta-percha (9 per cent.) dissolved in commercial chloroform. It is used as a protective to small abrasions, chaps, threatened bedsores, etc.

LIQUOR SODII SILICATIS (*solution of sodium silicate*), commonly called *solution of soluble glass*, is principally used in the treatment of fractures, applied on successive layers of roller bandage as a permanent dressing.

Class VI.—Coloring Agents.

What are coloring agents?

They are employed almost exclusively to give their particular color to tinctures, spirits and ointments, and are—

COCCUS (*cochineal*), the *female dried insect.* Coccus cacti, a native of Mexico and Central America, containing *carminic acid*, to which it owes its peculiar red color. It has been used also as an *antispasmodic*; dose gr. ⅛, t. d.

CROCUS (*saffron*), the stigmata of Crocus sativa (*Nat. Ord.* Iridaceæ), contains *safranin.* A *tincture* (*tinctura croci*) is officinal.

SANTALUM RUBRUM (*red saunders*), the *wood* of Pterocarpus santalinus, contains *santal*, *santalic acid* and *pterocarpin*, and is used to give a red color to pharmaceutical preparations.

INDEX.

- ABSINTHIN, 39
  - Absinthium, 39
- Abstracta, 20
- Abstracts, 20
- Acacia, 236
- Aceta, 23
- Acetanilid, 78
- Acetic acid, 150
- Acetphenetidin, 82
- Acidum aceticum, 150
    - dilutum, 150
    - glaciale, 149
  - arseniosum, 69
  - benzoicum, 227
  - boricum, 224
  - carbolicum, 225
  - citricum, 150
  - gallicum, 206
  - hydrobromicum dilutum, 91
  - hydrochloricum, 58
    - dilutum, 58
  - hydrocyanicum dilutum, 123
  - lacticum, 59
  - nitricum, 57
    - dilutum, 58
  - nitro-hydrochloricum, 58
    - dilutum, 58
  - oleicum, 239
  - phosphoricum, 58
    - dilutum, 58
  - salicylicum, 81
  - sulphuricum, 57
    - aromaticum, 57
    - dilutum, 57
  - sulphurosum, 223
  - tannicum, 205
  - tartaricum, 150
- Acids, mineral, 55
  - vegetable, 149
- Aconite, 143
- Aconitum, 143
- Adeps, 239
  - benzoinatus, 239
- [illegible]din, 138
- Æther, 104
- Alcohol, 129
  - diluted, 131
- Alkaline diuretics, 182
- Allium, 202
- Allspice, 165
- Aloe, 172
- Aloes, 172
- Alterative diuretics, 189
- Alteratives, 59
- Althæa, 237
- Alum, 212
- Alumen, 212
- Aluminii sulphas, 212
- Aluminium sulphate, 212
- Ammonii carbonas, 134
  - chloridum, 72
  - iodidum, 66
- Ammonium carbonate, 134
  - chloride, 72
  - iodide, 66
- Ammonia, 132
- Ammoniac, 203
- Ammoniacum, 203
- Amyl nitris, 121
  - nitrite, 121
- Amylum, 238
  - iodidum, 66
- Anæsthetics, 103
- Anaphrodisiacs, 151
- Anise, 167
- Anisum, 167
- Antacids, 217
- Anthelmintics, 179
- Anthemis, 38
- Antifebrin, 78
- Antimonii et potassii tartras, 142
- Antimonium, 141
- Antimony, 141
- Antiseptics, 220
- Antiseptic oils, 227
- Antipyretics, 76
- Antipyrine, 77
- Antispasmodics, 109

- Aphrodisiacs, 150
- Apiol, 157
- Apocynum, 188
- Apomorphinæ hydrochloras, 160
- Apomorphine hydrochlorate, 160
- Aqua, 236
  - chlori, 221
- Argenti cyanidum, 216
  - iodidum, 216
  - nitras, 215
    - dilutus, 216
    - fusus, 215
  - oxidum, 216
- Arnica, 148
- Aromatic fluid extract, 165
  - powder, 165
  - wine, 167
- Aromatics, 163
- Arsenic, 67
- Arsenium, 67
- Asafetida, 110
- Asafœtida, 110
- Aspidium, 180
- Astringents, 205
- Atropina, 96
- Atropine, 96
- Aurantii amari cortex, 167
  - dulcis cortex, 167
  - flores, 167
- Aurum, 64
- Azedarach, 179

- BALSAM of Peru, 204
  - of tolu, 204
- Balsamum Peruvianum, 204
  - tolutanum, 204
- Bark of cotton-root, 154
- Belladonna, 95
- Benzoic acid, 227
- Benzoinum, 203
- Benzoin, 203
- Bismuth, 216
- Bismuthum, 216
- Bitter orange peel, 167
- Bitters, 36
- Black mustard, 229
- Boric acid, 224
- Borax, 224
- Brandy, 131
- Brayera, 180
- Bromides, 190
- Bromine, 294
- Bromoform, 109
- Bromum, 234
- Brucine, 114
- Bryonia, 176
- Bryony, 176
- Buchu, 189
- Burgundy pitch, 230

- CACAO, butter of, 239
  - Caffeina, 137
- Caffeine, 137
- Calabar bean, 118
- Calamus, 166
- Calcii carbonas præcipitatus, 219
  - chloridum, 72
- Calcium, 218
  - chloride, 72
- Calendula, 76
- Calomel, 62
- Calumba, 34
- Calx chlorata, 221
  - sulphurata, 224
- Cambogia, 177
- Camphor, 111
- Camphora, 111
  - monobromata, 111
- Cannabis Americana, 93
  - indica, 93
- Cantharides, 231
- Cantharis, 231
- Cathartics, 168
- Capsicum, 163
- Capsules, 24
- Caraway, 167
- Carbolic acid, 225
- Carbo ligni, 162
- Cardamom, 165
- Cardamomum, 165
- Cardiac sedatives, 141
- Cardiac stimulants, 129
- Carminatives, 163
- Carum, 167
- Caryophyllus, 164
- Cascara sagrada, 169
- Cascarilla, 39
- Cassia fistula, 169
- Castanea, 209
- Castor oil, 170
- Catechu, 207
- Cera alba, 239
  - f
- Cer
- Cer
- Ce

Cerium oxalate, 216
Cetaceum, 239
Cetraria, 238
Chalk-mixture, 219
Chamomile, 38
Charcoal, 162
Chelidonium, 176
Chenopodium, 179
Chestnut, 209
Chimaphila, 190
Chinoidin, 45
Chinoidinum, 45
Chinoline, 82
Chirata, 34
Chloral, 89
Chlorinated lime, 221
    soda, 221
Chlorine, 221
    water, 221
Chloroform, 106
Chloroformum, 106
Chondrus, 238
Cimicifuga, 140
Cinchona, 41
Cinchonidina, 44
Cinchonidine, 44
Cinchonina, 44
Cinchonine, 44
Cinnamomum, 164
Cinnamon, 164
Citric acid, 150
Cloves, 164
Cocaine, 101
Coccus, 242
Cochineal, 242
Codeina, 88
Codeine, 88
Cod-liver oil, 70
Colchicum, 73
Collodion, 241
Collodium, 241
Colocynth, 171
Colocynthis, 171
Coloring agents, 242
Compound cathartic pills, 177
Conium, 126
Conine, 126
Copaiba, 194
Copper, 212
Coriander, 167
Coriandrum, 167
Cornus, 45
Corrosive sublimate, 60
Cotton-seed oil, 240
Cream of tartar, 175
Creasote, 226
Creasotum, 226
Crocus, 242
Croton-chloral-hydrate, 90
Croton oil, 177
Cubeb, 194
Cubeba, 194
Cuprum, 212
Cyanides, 124
Cydonium, 237
Cypripedium, 113

DECOCTA, 22
    Decoctions, 22
Demulcents, 236
Depresso-motors, 118
Diaphoretics, 195
Digestants, 34
Digitalin, 134
Digitalis, 134
Diluted acetic acid, 150
    alcohol, 131
    hydrobromic acid, 91
    hydrochloric acid, 58
    hydrocyanic acid, 123
    nitric acid, 58
    nitro-hydrochloric acid, 58
    phosphoric acid, 58
    silver nitrate, 216
    sulphuric acid, 58
Diuretics, 182
Dosage, 29
Drastic cathartics, 175
Duboisia, 101
Duboisine, 101
Dulcamara, 76

ELATERIN, 177
    Elaterinum, 177
Elm, 237
Emetics, 158
Emmenagogues, 156
Emollients, 239
Emplastra, 21
Emulsions, 23
Enemata, 178
Epsom salt, 174
Ergot, 152
Ergota, 152
Erythroxylon, 101
Escharotics, 233

Ether, 104
Ethereal oil, 113
Ethyl bromide, 109
Eucalyptus, 38
Euonymus, 173
Eupatorium, 39
Excito-motors, 114
Expectorants, 199
Extracta, 21
    fluida, 22
Extracts, 21
Extract of malt, 34
Extractum malti, 34

FENNEL, 167
    Ferrum, 48
Filix mas, 180
Flaxseed, 237
Flexible collodion, 241
Fluid extracts, 22
Fœniculum, 167
Fomentations, 23
Fowler's solution, 69
Frangula, 169

GALBANUM, 202
    Galla, 207
Gallic acid, 206
Gamboge, 177
Gargles, 23
Garlic, 202
Gastric sedatives, 162
Gaultheria, 166
Gelatin, 238
Gelsemium, 121
Gentian, 36
Gentiana, 36
Geranium, 208
Ginger, 165
Glacial acetic acid, 149
Glauber's salt, 174
Glycerin, 239
Glycerinum, 239
Glycerite of starch, 238
    of yolk of egg, 238
Glyceritum amyli, 238
    vitelli, 238
Glycyrrhiza, 237
Glycyrrhizinum, 237
    ammoniatum, 238
Gold, 64
Gossypii radicis cortex, 154
Goulard's extract, 211
Grain, 23
Gramme, 24
Granatum, 180
Granulated magnesian citrate, 174
Granules, 22
Grindelia, 199
Guaiac, 74
Guaiaci lignum, 74
    resina, 74
Guarana, 138
Gum arabic, 236

HAMAMELIS, 208
    Hæmatoxylon, 207
Hedeoma, 167
Hemp, Canadian, 188
    Indian, 93
Henbane, 100
Honeys, 22
Hops, 94
Horehound, 167
Humulus, 94
Hydragogue diuretics, 186
Hydrargyrum, 46
Hydrastis, 46
Hydrobromic acid, diluted, 91
Hydrochloric acid, 58
    diluted, 58
Hydroquinone, 82
Hyoscine, 92
Hyoscyamine, 100
Hyoscyamus, 100
Hypnone, 93
Hypnotics, 84
Hypophosphites, 70

ICELAND moss, 238
    Ichthyocolla, 238
Ignatia, 117
Illicium, 167
Indian cannabis, 93
Infusa, 22
Infusions, 22
Ingluvin, 34
Inhalations, 23
[illegible], 23

Iodum, 221
Ipecac, 159
Ipecacuanha, 159
Iris, 176
Irish moss, 238
Iron, 48
Irritants, 229
Isinglass, 238.

JABORANDI, 197
Jalap, 175
Jalapa, 175
Juglans, 172
Juniper, 190
Juniperus, 190

KAIRINE, 82
Kamala, 180
Kino, 207
Koosso, 180
Krameria, 207

LACTIC acid, 59
Lactucarium, 95
Lanolin, 239
Lard, 239
Lavandula, 166
Lavender, 166
Laxatives, 168
Lead, 209
Lemon, 150
Leptandra, 173
Levant wormseed, 179
Lime, 218
Limonis cortex, 150
  succus, 150
Linimenta, 21
Liniments, 21
Linseed, 237
Linum, 237
Liquores, 21
Liquor gutta-perchæ, 241
  sodii silicatis, 241
Liquorice-root, 237
Lithium, 186
Lobelia, 125
Logwood, 208
Lotions, 23
Lozenges, 20
Lugol's solution, 66
Lunar caustic, 216
Lupulin, 94
Lupulinum, 94
Lycopodium, 238

MACE, 164
Macis, 164
Magnesia, 174
Magnolia, 39
Male fern, 180
Malt, extract of, 34
Manganese, 52
Manganum, 52.
Manna, 169
Marrubium, 167
Marshmallow, 237
Matico, 195
Materia medica, 17
Matricaria, 39
Medicines, administration of, 31
  classification of, 32
Mellita, 22
Menispermum, 75
Mentha piperita, 166
  viridis, 166
Mercurials, 60
Methylene bichloride, 109
Metric system of weights, 24
Mezereon, 75
Mezereum, 75
Misturæ, 21
Mixtures, 21
Monobromated camphor, 111
Morphina, 88
Morphine, 88
Moschus, 109
Musk, 109
Mustard, 161
Myristica, 164
Myrrh, 156
Myrrha, 156

NAUSEATING diaphoretics, 196
Nitre, 184
Nitric acid, 57
  diluted, 57
Nitrites, 120
Nitroglycerin, 121
Nitrohydrochloric acid, 57
  diluted, 57
Nitrous oxide, 108
Nutgall, 207
Nutmeg, 164
Nux vomica, 114

OAK, 208
Ointments, 21
Oleata, 21
Oleates, 21
Oleic acid, 239
Olcoresina, 23
Oleoresins, 23
Opium, 84
Orange, 167
Origanum, 167
Oxytocics, 151

PANCREATIN, 34
Papain, 34
Papers, 20
Paraldehyd, 92
Pareira, 190
Parvules, 23
Pennyroyal, 167
Pepo, 180
Pepper, 164
Peppermint, 166
Pepsin, 34
Pepsinum, 34
Petrolatum, 240
Pharmacy, 17
Pharmacology, 17
Phenol, 225
Phosphates, 70
Phosphoric acid, 58
Phosphorus, 53
Physostigma, 118
Picrotoxin, 117
Picrotoxinum, 117
Pills, 20
Pilocarpina, 197
Pilocarpine, 197
Pilocarpus, 197
Pilulæ, 20
Pimenta, 165
Pinkroot, 179
Piper, 164
Pipsissewa, 190
Pitch, Burgundy, 230
    Canada, 230
Pix Burgundica, 230
    Canadensis, 230
    liquida, 204
Plasmine, 238
Plasters, 21
Plumbum, 209
Podophyllum, 17
Pomegranate, 18
Potassa, 234
Potassii acetas, 184
    bicarbonas, 184
    bichromas, 235
    bitartras, 175
    bromidum, 190
    carbonas, 184
    chloras, 185
    citras, 184
    cyanidum, 124
    et sodii tartras, 175
    iodidum, 66
    nitras, 184
    permanganas, 220
    sulphas, 175
    tartras, 175
Potassium, 183
    acetate, 184
    and sodium tartrate, 175
    bicarbonate, 184
    bichromate, 235
    bitartrate, 175
    bromide, 190
    carbonate, 184
    chlorate, 185
    citrate, 184
    cyanide, 124
    iodide, 66
    nitrate, 184
    permanganate, 220
    sulphate, 175
    tartrate, 175
Potato-bug, 232
Poultices, 23
Powders, 20
Preparations, 19
Prescription-writing, 25
Protectives, 241
Prunus virginiana, 38
Prussic acid, 123
Pulsatilla, 148
Pulveres, [illegible]
Pump [illegible] 180
Pyr [illegible]
Pyr [illegible]
Pyr [illegible]

QU [illegible]
Quilla [illegible]
Quince- [illegible]
Quinidi [illegible]
Quinidin [illegible]

Quinina, 44
Quinine, 44
Quinoidin, 44

REMEDIES, 18
Resin, 192
Resina, 192
Resorcin, 82
Rheum, 171
Rhubarb, 171
Rhus glabra, 209
  toxicodendron, 117
Rochelle salt, 175
Rosa centifolia, 208
  gallica, 208
Rosemary, 166
Rosmarinus, 166
Rubefacients, 229
Rue, oil of, 157

SABINA, 156
Saffron, 242
Sage, 107
Salicin, 79
Salicinum, 79
Salicylates, 79
Salicylic acid, 79
Salix, 46
Salol, 81
Saline cathartics, 173
  diaphoretics, 196
Saltpetre, 184
Salvia, 167
Sanguinaria, 202
Santalum rubrum, 242
Santonica, 179
Santonin, 179
Sarsaparilla, 74
Sassafras, 76
  medulla, 237
  pith, 237
Savine, 156
Scammonium, 177
Scammony, 177
Scilla, 187
Scoparius, 188
Scullcap, 113
Scutellaria, 113
Sedative diaphoretics, 196
  expectorants, 199
Sedatives, 141
Seidlitz powder, 175
Senega, 201
Senna, 172
Serpentaria, 78
Sevum, 239
Silver, 214
  cyanide, 124
  iodide, 216
  nitrate, 216
  oxide, 216
Sinapis, 226
Slippery-elm bark, 237
Soda, 234
  solution of, 218
Sodii acetas, 186
  arsenias, 69
  benzoas, 227
  bicarbonas, 218
  boras, 224
  bromidum, 190
  carbonas, 218
  chloras, 218
  iodidum, 66
  phosphas, 174
  pyrophosphas, 174
  salicylas, 79
  sulphas, 174
  sulpho-carbolas, 226
Sodium, 217
  acetate, 186
  arseniate, 69
  benzoate, 227
  bicarbonate, 218
  borate, 224
  bromide, 190
  carbonate, 218
  iodide, 66
  nitrite, 121
  phosphate, 174
  pyrophosphate, 174
  salicylate, 79
  sulphate, 174
  sulpho-carbolate, 226
Solution of potassa, 184
  gutta-percha, 242
  soda, 218
  sodium silicate, 241
Solutions, 22
Spanish-fly, 231
Sparteine, 139
Spearmint, 166
Spermaceti, 239
Spigelia, 179
Spirit of Mindererus, 197
  nitrous ether, 197

Spiritus, 22
  ætheris compositus, 113
   nitrosi, 197
  frumenti, 131
  vini gallici, 131
Spirits, 22
Squill, 187
Star-anise, 167
Starch, 238
Stigmata maidis, 191
Stillingia, 76
Stimulating emmenagogues, 156
Stramonium, 99
Stronger white wine, 131
Strophantus, 139
Strychnina, 114
Strychnine, 114
Suet, 239
Sulphides, 224
Sulphites, 224
Sulpho-carbolates, 226
Sulphur, 170
  iodide, 66
Sulphurated potassa, 170
Sulphuric acid, 58
Sulphuris iodidum, 66
Sulphurous acid, 223
Sumach, 209
Suppositoria, 21
Suppositories, 21
Sweet orange peel, 167
  spirit of nitre, 197
Syrupi, 22
Syrups, 22

TABACUM, 127
Tamarind, 169
Tamarindus, 169
Tanacetum, 157
Tannic acid, 205
Tansy, 157
Tar, 204
Taraxacum, 188
Tartar emetic, 142
Tartaric acid, 150
Terebene, 205
Terebinthina, 192
Thalline, 82
Theobroma, 239
Therapeutics, 18
Thymol, 227
Tinctura, 22
Tinctures 22
Tobacco, 127
Tonics, 36
Tragacanth, 237
Tragacanthus, 237
Triticum, 190
Triturates, 22
Triturationes, 22
Troches, 22
Trochisci, 20
Turpentine, 192
Turpeth mineral, 162

ULMUS, 237
Unguenta, 21
Urethan, 93
Ustilago, 154
Uterine sedatives, 155
Uva ursi, 190

VALERIAN, 110
Valeriana, 110
Vanilla, 168
Vegetable acids, 149
Veratrina, 147
Veratrine, 147
Veratrum viride, 145
Vesicants, 231
Viburnum, 155
Vina, 22
Vinegars, 23
Vinum album, 131
  aromaticum, 167
  fortius, 181
  rubrum, 131
Viola tricolor, 169
Virginia snakeroot, 38

WATER, 236
Waters, 22
Weights and measures, 23
Whisky, 131
Wine, 131
Wines, 22
Witch hazel, 208
Woorara, 127

ZINC, 213
Zincum, 213
[illegible] 165

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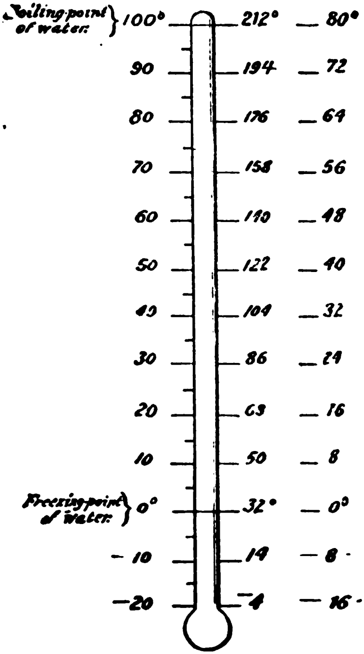

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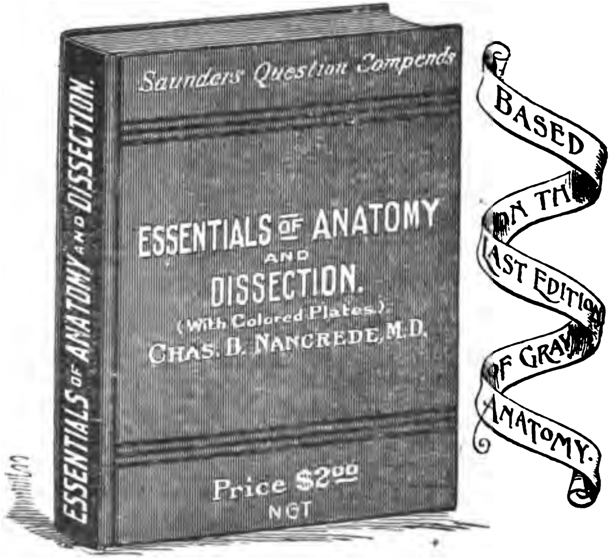
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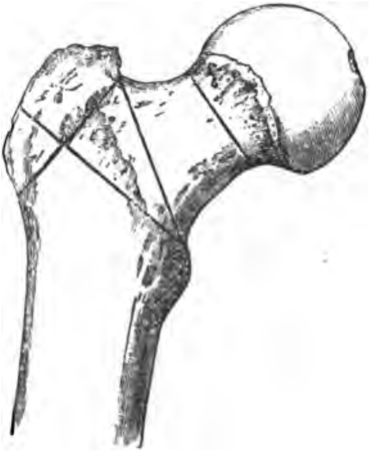

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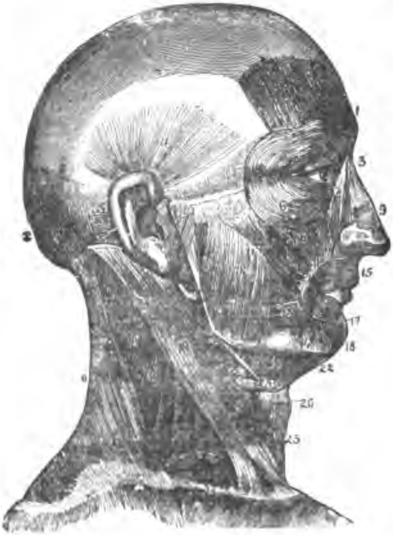

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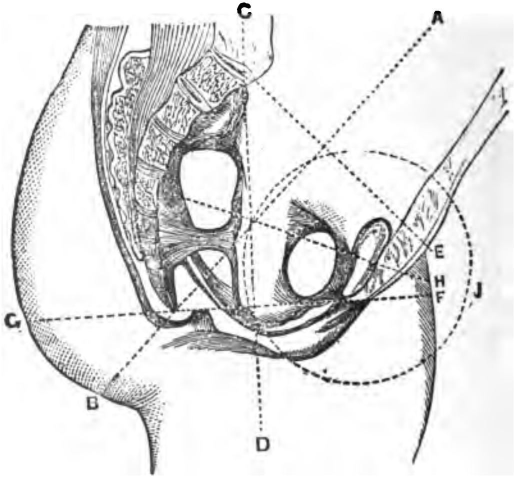

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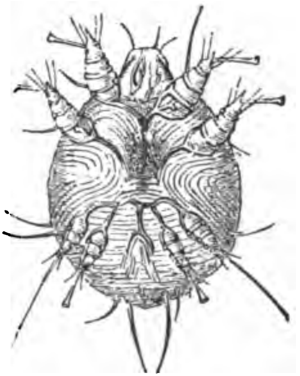

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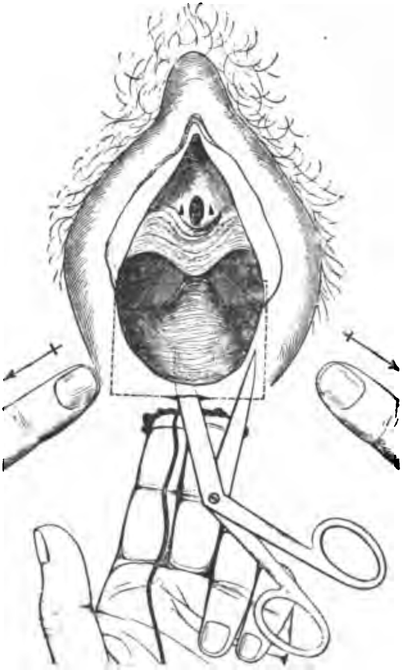

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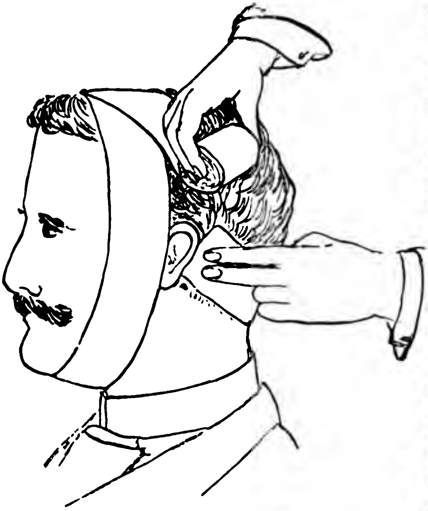

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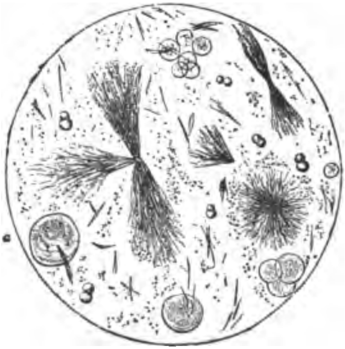

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575

INDEX.

PAGE
Announcement 1
American Text-Book of Surgery 2, 3
Vierordt and Stuart's Medical Diagnosis . . 4
Keating's New Unabridged Dictionary of Medicine 5
Saunders' Pocket Medical Lexicon 6
Nancrede's Anatomy and Manual of Dissection . 7
DeSchweinitz's Diseases of the Eye 8
Garrigue's Diseases of Women 9
Norris' Syllabus of Obstetrical Lectures . . 9
Saunders' Pocket Medical Formulary 10
Saunders' Series of Question Compends . . 11
Hare's Physiology 12
Martin's Surgery 13
Nancrede's Anatomy 14
Wolff's Chemistry 15
Ashton's Obstetrics 16
Semple's Pathology, etc. 17
Morris' Materia Medica 18
Morris' Practice of Medicine 19
Cragin's Gynæcology 20
Stelwagen's Diseases of the Skin 21
Martin's Minor Surgery, etc. 22
Semple's Legal Medicine, etc. 23
Jackson and Gleason's Diseases of Eye, Nose, and Throat 24
Powell's Diseases of Children 25
Wolff's Examination of Urine 26
Sayre's Practice of Pharmacy 27
Works in Preparation and in Press 28
Martin and Hare's Wounds and Obstruction of the Intestines 29

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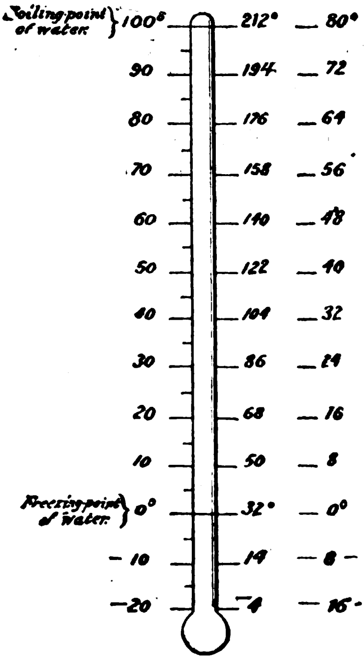

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